Programmatic Environmental Assessment on Allowable Adjacent Landowner Activities Incorporating Ecosystem Management Practices on Federal Lands at Grapevine and Lewisville Lakes, Texas

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Executive Summary

Modifying guidelines that establish allowable mowing, underbrushing and pedestrian access path activities on Federal lands is considered an *action* as defined by the National Environmental Policy Act, and this environmental assessment documents potential environmental impacts associated with a range of allowable mowing, underbrushing and access path activities by adjacent landowners on Federal lands. Multiple approaches were considered to meet the U.S. Army Corps of Engineers' (USACE) underlying need of managing and conserving natural resources while providing quality public outdoor recreation experiences for present and future generations. USACE's management and conservation practices seek to: (1) provide for long term public access to, and use of, natural resources in cooperation with other Federal, State and local agencies, as well as the private sector; and (2) to manage and conserve fish; wildlife; forests; wetlands; grasslands; soil; air; and water resources.

This programmatic environmental assessment examined the environmental consequences of seven alternative guidelines for adjacent landowner mowing and/or underbrushing activities on Federal lands at Grapevine and Lewisville Lakes. An analysis of direct, indirect and cumulative effects of these alternatives lead USACE to select a set of guidelines referred to as the "Narrow Shoreline Variance" alternative as the preferred alternative. Summarizing:

- This alternative would continue to allow adjacent landowners to apply for a permit for mowing and/or underbrushing for a 25-foot wide zone at Grapevine Lake and a 50-foot wide zone at Lewisville Lake, which is what the current guidelines allow.
- Additionally, however, in those areas along the shoreline where there is not enough width between the allowable mowing/underbrushing zone and the conservation pool elevation to provide adequate habitat or water quality protection buffers, the adjacent land owner could apply for a variance to the mowing/underbrushing permit that would allow additional mowing and underbrushing all the way to the conservation pool. For both Grapevine and Lewisville Lake, USACE has determined that at least 50 feet beyond the current mowing/underbrushing zone is needed to provide adequate habitat or water quality protection buffers. These narrow shoreline variances would impose certain ecosystem based vegetation management requirements on the adjacent landowners to offset the adverse habitat impacts that might occur. Geographic Information System (GIS) analysis indicate that approximately 144 acres would be added to the 1,782 acres that currently fall within the allowable mowing/ underbrushing zone at the two lakes under this alternative.
- In those areas beyond the mowing/underbrushing zone that are not considered "narrow shorelines", a zone referred to as the habitat zone in this environmental assessment, USACE has developed guidelines for ecosystem based vegetation management prescriptions that community groups, lead by a master naturalist, could implement with a permit issued by USACE. GIS analysis indicates that there are approximately 24,269 acres in the habitat zone under this alternative. If the entire habitat zone has these ecosystem based prescriptions implemented, approximately 3,800 additional habitat units (defined in Chapter 3) will be available to wildlife beyond the existing 14,622 habitat units currently available to wildlife at the two lakes.
- Permits for access paths between the Federal property line and the shoreline can be issued to individual adjacent landowners, or to groups of adjacent landowners seeking a single path to be used by all in the group. Group-use or community access paths will be favored over individual access paths.

The potential adverse environmental consequences of the preferred alternative include minor (not significant) increases in sheet and rill erosion, non-point pollution, potential to encounter wetlands in the mowing/underbrushing zone, air emissions, noise and intense recreational activities on lands designated for low density recreational or habitat use. Additionally, minor (not significant) decreases in floral and faunal diversity are expected. Finally, significant beneficial habitat quality effects are potentially available to wildlife if the ecosystem based vegetation management prescriptions are fully implemented at the two lakes. No significant cumulative effects are expected under this alternative.

Chapter 1: Introduction

Dallas, Tarrant, and Denton Counties form the heart of north central Texas, contain a variety of natural resources, and have a continual and expanding population. The three counties cover about 2700 square miles (approximately 1.7 million acres) with gentle topography that ranges from an elevation of 382 to 960 feet above mean sea level (Hightower, 2002; Maxwell, 2002; Odum, 2002). Three different native vegetation types occur in this region of Texas, of which few undisturbed patches remain due to urbanization (Diggs et al., 1999). Prior to human settlement, the Blackland Prairie covered most of Dallas County in the east, while the eastern Cross Timbers ran through the central portion of north central Texas, and the Grand Prairie occupied the western portion (Diggs et al., 1999).

The populace of this region began to escalate in the 1840's when the Republic of Texas authorized recruitment of settlers (Hightower, 2002; Maxwell, 2002; Odum, 2002). In 1860 approximately 11,000 people, primarily engaged in agriculture, resided in the area and the arrival of a railroad in the 1870's resulted in a surge of development (Hightower, 2002; Maxwell, 2002; Odum, 2002). Almost half of Denton County in 1880 was cultivated and the county was reported to be the United State's largest inland wheat market by the end of the century (Odum, 2002). Around this time, the cattle drives came to an end and more farmers moved into Tarrant County (Hightower, 2002). By 1900 the region's population had increased to 163,000 (U.S. Bureau of Census) and manufacturing began its expansion in Dallas County (Maxwell, 2002). Agriculture declined quickly after World War II and industry took over. Growth and development continued in the whole region and by 1950 the population had ballooned to one million (U.S. Bureau of Census). With the completion of Interstate Highway 35 in the 50's and the east and west forks in the 80's, commuting increased and areas outside the population centers rapidly became urbanized (Hightower, 2002; Maxwell, 2002; Odum, 2002). These trends of expansion have continued to the present day and the census for 2000 reported a population of 4 million (U.S. Bureau of Census), with a projected population of over 6 million in 2030 (NTCOG, 2004).

The U.S. Army Corps of Engineers (USACE) constructed Grapevine and Lewisville Lakes (see Figure 1-1) in the 1950's and continue to operate these reservoirs for flood damage reduction, water supply, recreation, and natural resource management. An Environmental Impact Statement was developed for Grapevine Lake in March 1977 and for Lewisville Lake in 1973, which addressed the environmental impacts of the operations and maintenance of the reservoirs. Engineering Regulation (ER) 1130-2-406 dated 13 December 1974, superseded by ER 1130-2-406 dated 31 October 1990, directed USACE to develop a shoreline management plan as part of the overall Lake Master Plan for all of its reservoirs. Lewisville Lake Lakeshore Management Plan was finalized in July 1976, and Grapevine Lake Lakeshore Management Plan was finalized in August 1976. To implement the shoreline management plans on a consistent basis USACE developed specific guidelines that would allow a certain amount of mowing and access paths on government property to allow adjacent landowners to have a buffer for fire protection, public safety, public access, and pest control. This Programmatic Environmental Assessment is only addressing the mowing, underbrushing and access path guidelines of the Shoreline Management Plan. These guidelines have been revised over time, but the current guidelines (Appendix A) allow for adjacent landowners to obtain one permit from USACE to mow a 50-foot buffer on Lewisville Lake and a 25-foot buffer on Grapevine Lake and/or to obtain an additional permit from USACE to maintain access paths to the lake. In addition, since mowing is difficult when the land is overgrown in brush, there are guidelines on underbrushing within the allowable mowing zones. ER 1130-2-406 is somewhat stringent with regard to allowable mowing and access paths. Specifically it states that no adjacent landowner shall be allowed to mow without a permit and that public land shall at no time have the appearance of private property. Additionally, at no time shall a permit compromise the integrity of the natural resources of the land. Due to increasing numbers of subdivisions and/or developments adjacent to public lands, and the varying degrees of encroachment onto government property at Lewisville and Grapevine Lakes, USACE has decided to take another look at its mowing, underbrushing, and access paths guidelines to determine whether new guidelines are needed to ensure that allowable mowing, underbrushing and access path activities are not causing significant damage to natural resources, and to ensure adjacent landowners are in compliance with our mission to properly manage the natural resources at Grapevine and Lewisville Lakes. This Programmatic Environmental Assessment examines the environmental effects associated with allowing a variety of mowing/underbrushing and habitat zone widths, and allowing a variety of pedestrian access path options, while at the same time maintaining the integrity of natural resources including fish and wildlife habitat, and water quality at both lakes.

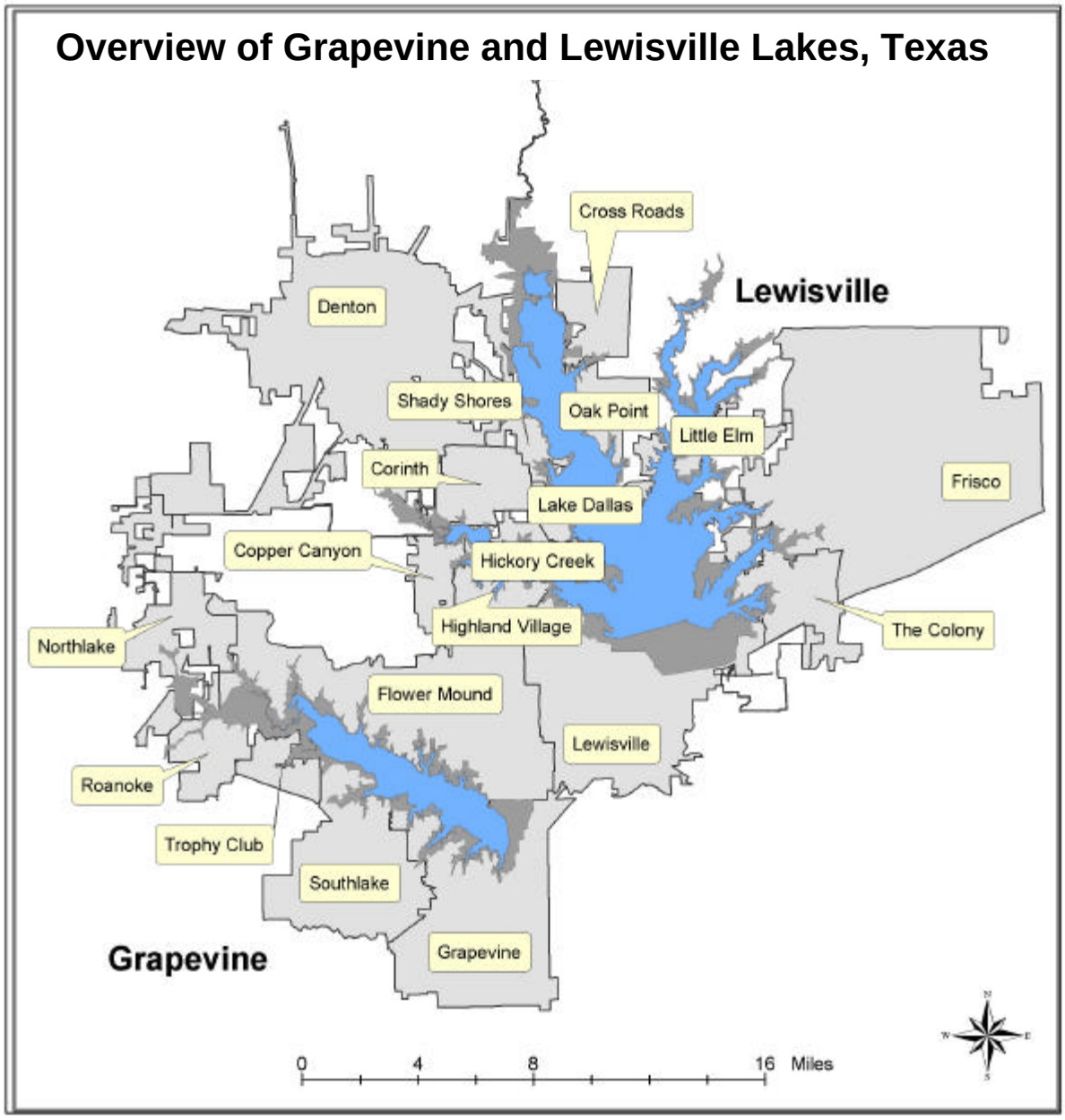


Figure 1-1. Overview of Grapevine and Lewisville Lake Region, north central Texas.

The underlying need being addressed by USACE at Lewisville and Grapevine Lakes, Texas, is to manage and conserve natural resources while providing quality public outdoor recreation experiences for present and future generations. Natural resource management, through the use of sound environmental stewardship, protection, compliance and restoration practice helps USACE promote environmental awareness and sustainability. USACE's management and conservation practices seek to provide for long-term public access to, and use of, natural resources in cooperation with other Federal, State and local agencies, as well as the private sector. Natural resources considered by USACE for management and conservation efforts include fish, wildlife, forests, wetlands, grasslands, soil, air and water, with the provision for public recreation opportunities. To properly manage these resources, USACE proposes to implement ecosystem-based vegetation management practices. Implementation of these practices must consider the environmental effects of allowing adjacent landowners to mow, clear underbrush, and create access paths on public lands.

The purpose of modifying mowing, underbrushing, and access paths guidelines for adjacent landowners on Federal lands encompassing Lewisville and Grapevine Lakes is to allow those landowners a reasonable measure of fire protection, public safety, and pedestrian access, while balancing these permitted private activities with the need to conserve and manage fish, wildlife, forests, wetlands, grasslands, soil, air and water resources.

There are multiple ways to approach allowable mowing and/or removal of underbrush by adjacent landowners on Federal lands. For example, mowing and underbrushing on Federal lands could be completely prohibited. While this approach would maximize managing for, or conservation of, certain resources (e.g. water resources), it would reduce pedestrian access to the lakes. Likewise, allowing unlimited mowing and underbrushing by adjacent landowners would increase pedestrian access, but it would be counter to the goal of managing and conserving natural resources.

The objective of this programmatic environmental assessment is to document the environmental consequences of an array of ecosystem vegetation management prescriptions and of mowing and underbrushing alternatives, such that USACE can make an informed decision on which prescriptions and mowing and underbrushing alternatives best meet the purposes of this action in meeting the underlying need.

Chapter 2: Proposed Action and Alternatives

Initial acquisition of Federal lands at Grapevine and Lewisville Lakes took place in the late 1940's and early 1950's. Land acquisition policy at that time resulted in fee simple acquisition of most lands up to elevation 572 feet at Grapevine Lake and 537 feet at Lewisville Lake. These elevations represent the probable maximum flood elevation of each lake. In a relatively few locations, mostly in the upper reaches of each lake, a flowage easement estate was acquired in lieu of fee simple acquisition. Additionally, in areas planned for intensive park development, some lands were acquired above the probable maximum flood elevation.

In the late 1950's and early 1960's land acquisition policy became much more conservative, and on lakes in existence at the time, such as Grapevine and Lewisville Lakes, Public Law 85-500 directed that considerable acreage be reconveyed, or sold back, to the original owners. These reconveyed lands were generally located between elevations 560 and 572 at Grapevine Lake, and 529 and 537 at Lewisville Lake. In total, 1849 acres at Grapevine Lake, and 3,679 acres at Lewisville Lake were reconveyed to former owners. However, in most areas designated for intensive park development, very little land was reconveyed. Furthermore, at Lewisville Lake, no lands were reconveyed in the entire portion of the lake extending upstream from the old Lake Dallas dam. The Federal land in this area was acquired almost entirely from the City of Dallas, who owned the land as part of Lake Dallas. Federal ownership in this area generally extends up to elevation 537 feet. Where lands were reconveyed, particularly in areas with steep or moderately steep shorelines, the width of Federal land from the boundary line to the conservation pool elevation was reduced considerably.

In the late 1980's, the conservation pool elevation of Lewisville Lake was permanently raised from 515 feet to 522 feet. This permanent increase in the conservation pool elevation was made possible by the reallocation of a portion of Lewisville Lake's flood storage capacity to the newly constructed Ray Roberts Lake. The seven-foot increase in the conservation pool (sometimes referred to as the normal pool) resulted in further reduction of the width of Federal land surrounding Lewisville Lake, most noticeably in those relatively steep shoreline areas where lands had been reconveyed. Shoreline areas that were reduced in width by the reconveyance of lands and the increase in the conservation pool to the extent that the width of the majority of Federal ownership is less than 100 horizontal feet shall be referred to as "narrow shorelines". These areas are identified in Appendix B.

Figure 2-1 helps define the terms used to establish a range of reasonable alternatives that were analyzed in this environmental assessment. The figure is bounded at the top by the *Federal property line*, which is well defined and fixed, is typically obvious when encountered at both Grapevine and Lewisville Lakes, and legally separates adjacent landowners from Federal lands. At the bottom of the figure is a representation of the *shoreline*, which follows a specific elevation as measured above mean sea level (msl). The shoreline is variable, based on drought or flood or lake pool maintenance operations. Under extreme drought conditions, Grapevine Lake's shoreline has dropped to 521 feet msl (2/26/79), while Lewisville Lake's shoreline dropped to 507 feet msl (10/15/00). Under extreme conditions, the shoreline can cross the Federal property line, going up to or slightly higher than the elevation of the dam's emergency spillway elevation (Grapevine Lake's emergency spillway is 560 feet msl; Lewisville Lake's emergency spillway is 532 feet msl).

Figure 2-1 also indicates the *conservation pool elevation*, the elevation at which USACE attempts to maintain the lakes under normal conditions. Grapevine Lake's conservation pool elevation is 535 feet msl; Lewisville Lake's conservation pool elevation is 522 feet msl. While this line is not intentionally demarked on the ground, it is fairly obvious at the lake since there is often a distinct erosion face at this elevation around the lake.

Figure 2-1 shows a line representing where *mowing and underbrushing limits* occur, and is established as a distance from the Federal property line. This line is not demarked on the ground, and there is not an easy way to visualize where the line is on the ground when visiting the lake without a tape measure. Under existing conditions (25 foot mowing/underbrushing zone at Grapevine Lake and 50 mowing/underbrushing zone at Lewisville Lake), approximately 1,782 acres fall within this zone.

The area between the current mowing/underbrushing zone and conservation pool, designated in this environmental assessment and Figure 2-1 as the *habitat zone*, contains approximately 24,413 acres. USACE has developed a set of ecosystem based vegetation management prescriptions that will be allowed in the

habitat zone (see Appendix H). Community groups, lead by a master naturalist, will be able to apply for a permit to implement some or all of these prescriptions in an attempt to improve the habitat quality on Federal lands surrounding Grapevine and Lewisville Lakes. These prescriptions include removal of invasive and undesirable vegetative species, planting of native species, and other activities to enhance wildlife habitat.

Finally, Figure 2-1 has a representation of a pedestrian *access path*, which some adjacent landowners have been issued a permit to maintain for accessibility to the lake. For this environmental assessment, 3 pedestrian access path scenarios were considered: no access paths, individual access paths, and community access paths. As implied, the no access paths alternative would not permit access paths between adjacent landowner property and the shoreline. The individual access paths alternative would allow each individual adjacent landowner to request a permit to develop and maintain a 3 foot wide access path from their own private property across Federal land and to the shore. The community access paths alternative would allow groups of individuals, perhaps a neighborhood association, to request permits to develop and maintain a single path that a "community" of adjacent landowners would use to access the shore. In all cases, however, permits for pedestrian access paths would be issued on a case-by-case basis and preference would be given to community paths over individual paths.

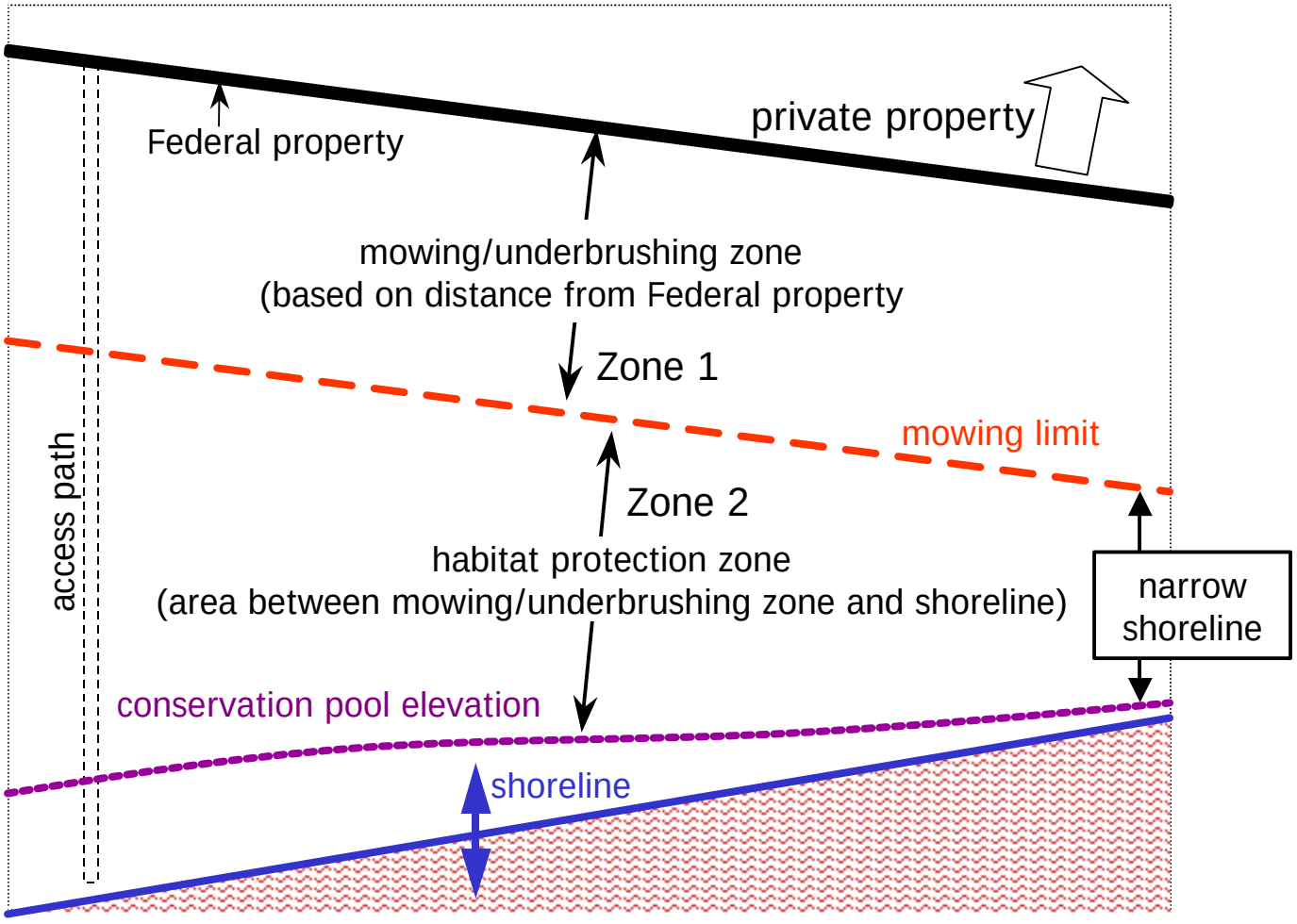


Figure 2-1. Stylized map allowing definitions of proposed lines and zones utilized in this environmental assessment.

An estimate of the number of potential paths can be approached in two ways: based upon the number of private parcels of land abut the Federal property line around each lake; and based upon the total length of the Federal property line and a reasonable estimate of the average lot width. Grapevine Lake's Federal property line currently has approximately 317 individual parcels and Lewisville Lake's Federal property line currently has approximately 872 individual parcels, totaling 1,189 parcels in the study area. However, some of these parcels are quite large and are subject to future sub-dividing. If an ultimate 100-foot wide lot is assumed, a total of 351 miles of property line at the two lakes, could potentially generate approximately 18,500 adjacent lots and an equal number of pedestrian access paths could be foreseeable in the future if the individual access path scenario is selected. Mowing and underbrushing to create access paths may decrease root systems and result in soil erosion, as stated in the Mowing/Underbrushing part of this section. The relative degree of impact of each access path sub-alternative on erosion can be estimated by the number of access paths: between approximately 1,200 and 18,500 potential access paths inducing erosion if the individual access path sub-alternative is chosen, 5 to 15 times fewer access paths inducing erosion if the community access path option is chosen, and no access paths inducing erosion if the no access paths option is chosen.

The lines illustrated in Figure 2-1 allow a definition of two zones: Zone 1, an area where mowing and underbrushing activities are allowed as a measure to provide adjacent landowners access, firebreaks, and undesirable species control, and; Zone 2, an area where mowing and underbrushing activities are prohibited to provide wildlife habitat on Federal lands and water quality protection at the shoreline by reducing erosion and other nonpoint source pollutants (e.g. fertilizers or pesticides that might be applied by adjacent landowners.)

While many combinations of widths of Zones 1 and 2 and pedestrian access paths can be considered (more than 20 combinations were initially considered), six alternatives were chosen to be analyzed in detail:

Alternative 1 (No Action, or status quo): This action would continue with written permits for a 25-foot mowing/underbrushing zone at Grapevine Lake and a 50-foot mowing/underbrushing zone at Lewisville Lake, with the remainder of the area managed as a wildlife habitat zone using ecosystem management practices. Permits for community access paths would be allowed under this alternative. Currently, not all areas that fall within the current allowable mowing/underbrushing zones are mowed; however, many areas around each lake are mowed and/or underbrushed past the allowable limits. Which adjacent landowners mow and/or underbrush (either within or beyond the allowable limits) does not appear to be predictable, but it appears that once one landowner begins the activity, others are more likely to follow. Further, the wider the distance between the Federal property line and the lake, especially when the distance exceeds several hundred feet, the less likely it appears that adjacent landowners are willing to undertake mowing/underbrushing beyond the allowable limit. Likewise, as the distance becomes narrower, the more likely adjacent landowners are to mow and/or underbrush past the allowable limit.

Alternative 2 (No mowing/underbrushing alternative): This action would not allow any mowing by adjacent landowners on public lands at either lake, with all areas managed as wildlife habitat using ecosystem management practices. Permits for community access paths would be allowed under this alternative.

Alternative 3 (Fire safety alternative): This action would establish a 25-foot wide mowing/underbrushing zone at both lakes to provide a fire safety buffer, with all remaining areas managed as wildlife habitat using ecosystem management practices. Permits for community access paths would be allowed under this alternative.

Alternative 4 (Minimum habitat buffer alternative): This action would continue with written permits for a 25-foot mowing/underbrushing zone at Grapevine Lake and a 50-foot mowing/underbrushing zone at Lewisville Lake, but would also establish a 25-foot wide minimum habitat buffer zone along the conservation pool elevation, such that no mowing/underbrushing activities would be allowed within the habitat buffer zone, even if the habitat buffer zone occurred within the mowing/underbrushing zone. In other words, the habitat zone would dominate over the mowing/underbrushing zone where the distance between the Federal property line and the conservation pool elevation is narrow.

Alternative 5 (Expanded mowing/underbrushing alternative): This action would expand with the mowing/underbrushing zone to 50 feet at Grapevine Lake and to 100 feet at Lewisville Lake, with the

remainder of the area managed as a wildlife habitat zone using ecosystem management practices. Permits for community access paths would be allowed under this alternative.

Alternative 6 (Mowing/underbrushing all areas alternative): This action would allow adjacent landowners to apply for a permit to mow and underbrush all the way to the shoreline on the property adjacent to their property. Permits for access paths would not be needed because adjacent landowners would have access to the lake due to mowing/underbrushing permits.

Alternative 7 (Narrow shoreline variance): This action would continue with written permits for a 25-foot mowing/underbrushing zone at Grapevine Lake and a 50-foot mowing/underbrushing zone at Lewisville Lake, but would allow variances for additional mowing/underbrushing if the width between the Federal property line and the conservation pool is too narrow to support a viable habitat zone or a create a minimal water quality buffer zone along the shoreline. If there is less than 50 linear feet between the mowing/underbrushing zone and the conservation pool elevation, adjacent landowners could apply for a permit to mow and/or underbrush lands between the USACE property line and the conservation pool (up to 75 feet at Grapevine Lake and up to 100 feet at Lewisville Lake). For those adjacent landowners receiving a mowing/underbrushing permit to mow and/or underbrush past the normal allowable distance and into the narrow shoreline (i.e. a variance), there will be ecosystem management prescriptions requirements imposed. The requirements will include, but are not limited to such things as fewer mowings each season and leaving clumps of unmowed patches where native grass and shrub species have been planted. Permits for community access paths would be allowed under this alternative.

The width of the mowing/underbrushing zone selected for each alternative is based in large part on minimum recommended widths of buffer zones for water quality, habitat, and habitat corridor purposes. Buffer widths ranging from less than 20 feet for water quality protection, to habitat zones exceeding 1,600 feet for birds can be found in the literature (see Tables 2-1 and 2-2). For water quality in Table 2-2, studies conducted using wooded filter strips have resulted in a higher percentage of sequestered nutrients compared to grass strips. A more detailed summary of the results obtained from these studies is presented in Chapter 4, Impacts of Proposed Action and Alternatives, C: Water Quality. Buffer widths for ecological concerns are typically wider than those recommended for water quality concerns, as seen in Table 2-3, but relatively narrow natural vegetation buffer strips can provide a corridor for many species of wildlife to move about and survive in a fragmented ecosystem. Studies conducted to determine buffer width necessary to maintain species diversity and richness have proven to be specific to the not only the target species, but also to the type of habitat within the buffer area. In general, the widths are based upon the range of the species. For example, birds require larger buffers due to their relatively broader ability to travel compared to other animals, while plants need smaller areas to maintain diversity. These studies are also summarized in Chapter 4, E: Biological Resources.

At Grapevine and Lewisville Lakes, with fixed amounts of land between the Federal property line and the shoreline, increasing the width of the mowing/underbrushing zone has a direct and inversely proportional effect on the amount of land available for the habitat zone.

Table 2-1. Buffer Zones for Water Quality

% TSS Removed	% Phosphorus Removed	% Nitrogen Removed	Width (feet)	Authors
92			s 81	Young et al. (1980)
75			s 98	Lynch et al. (1985
80			s 200	Horner and Mar (1982)
90			s 62	Peterjohn and Correll (1984)
94			s 197	Peterjohn and Correll (1984)
85			s 30	Ghaffarzadeh et al. (1996)
84	79	73	s 30	Dillaha et al. (1989)
	80	89	s 33	Shisler et al. (1987)
	95	100	s 63	Vought et al. (1995)
	90	90	s 16	Madison et al. (1992)

Table 2-2. Recommended Buffer Widths for Habitats

Function	Recommended Width (feet)	Authors
Reptile/Amphibian Habitat	s 100	Burbrink et al. (1998)
	> 98	Rudolph and Dickson (1990)
	s 541	Semlitsch (1998)
	s 240	Burke and Gibbons (1995)
	s 131	Vesely and McComb (2002)
	s 328	Darveau et al. (1995)
Bird Habitat	s 328	Hodges and Krementz (1996)
	s 328	Mitchell (1996)
	s 328	Trinquet et al. (1990)
	s 1640	Spackman and Hughes (1995)
	s 1640	Kilgo et al. (1998)
	s 328	Keller et al. (1993)
	s 492	Vander Haegen and deGraaf (1996)
	s 131	Hagar (1999)
	s 246	Johnson and Brown (1990)
Mammal Habitat	s 164	Dickson (1989)
	s 49	Chapman and Ribic (2002)
Vegetation	s 98	Spackman and Hughes (1995)

Chapter 3: Affected Environment of the Region and Project Area

The study area for this environmental assessment is the area between the Federal property line and the conservation pool level at the two lakes (approximately 26,662 acres) (see Figures 3-1 and 3-1). All spatial analyses undertaken for this environmental assessment were completed using geographic information system (GIS) technology. The GIS data utilized in this environmental assessment represent the best available data for the Grapevine and Lewisville Lake areas. GIS technology, while providing many advanced capabilities in the way questions about environmental impacts can be asked, is limited in the absolute accuracy of maps and data that are generated. For example, Global Positioning Satellite (GPS) receivers were utilized to record the spatial coordinates of the Federal property line. GPS data are often accurate to within a meter or two, but can be 30 meters or more from true. None-the-less, USACE has confidence that the GIS data utilized in this environmental assessment has ample accuracy to make decisions at the programmatic level. Areas were ground truthed to ensure that the level of accuracy was sufficient for this level of analysis. As such, no claims are made to the accuracy or completeness of the data or to its suitability for a particular use other than a programmatic assessment of mowing/underbrushing activities in the study area.

A. Current Land Use and Land Cover

USACE manages approximately 18,000 acres of land surrounding Lewisville Lake and 8,700 acres surrounding Grapevine Lake. Areas above the conservation pool elevation are allocated into one of the following categories, according to EP 1130-2-550 (Table 3-1):

1. Operations. Lands for operation of the project, i.e., flood control, hydropower, navigation, water supply, etc.
2. Recreation. Lands for public recreation.
3. Fish and Wildlife. Lands for the management of fish and wildlife located on project lands.

Allocated project lands are further classified to ensure development and resource management consistent with authorized project purposes and the provisions of NEPA and other Federal laws:

1. Project Operations. Lands required for the structure, operations center, office, maintenance compound and other areas that are used solely for project operations.
2. Recreation. Land developed for intensive recreational activities by the visiting public.
3. Mitigation. Land acquired or designated specifically for mitigation.
4. Environmental Sensitive Areas (ESAs). Areas where scientific, ecological, cultural or aesthetic features have been identified. Included in this land classification are areas dominated by climax or near-climax vegetation; areas where vegetation has been planted as mitigation for loss of natural resources; riparian areas, wetlands and other high-value aquatic sites; areas valued for roosting, nesting, or feeding for important wildlife species; areas where natural vegetation or topography serves as important visual and noise buffers; and areas having exceptional aesthetic qualities such as large expanses of wildflowers (environmental stewardship). Limited or no development of public use is contemplated on land in this classification. No agricultural or grazing uses are permitted on this land.
5. Multiple Resource Management. Lands managed for one or more of, but not limited to, these activities to the extent that they are compatible with the primary allocation(s).
    a. Recreation – Low Density. Recreation activities such as hiking, primitive camping, wildlife observation, or hunting.
    b. Wildlife Management General – Fish and wildlife management activities (environmental stewardship).
    c. Vegetative Management – Managed for the protection and development of forest and vegetative cover (environmental stewardship).
6. Easement lands. All lands for which the Corps holds an easement interest but not fee title.

Table 3-1. Approximate Allocation of Land under the Jurisdiction of USACE between the Federal Property Line and the Conservation Pool Level

	Management Areas (in acres)			
	Wildlife	Recreation	Operations	Total
Grapevine Lake	4,052	4,063	600	8,715
Lewisville Lake	11,292	4,998	1,190	17,480

Lands designated as wildlife management areas (those designated as environmentally sensitive areas, wildlife management areas, and vegetative management areas) account for approximately 59% of the total lands at Grapevine and Lewisville Lakes while designated recreational lands account for approximately 35%.

Using recent IKONOS satellite imagery, lands between the Federal property line and the conservation pool were classified into five potential land cover classes: woody, herbaceous, maintained grasses, barren and other (See Appendix C for methodology). The satellite imagery analysis resulted in good separation into woody (leaves, branches and boles – trees and shrubs [15,514 acres at both lakes]) and non-woody (herbaceous [7,886 acres at both lakes) classes. The Barren class comprised areas of bare ground such as asphalt roads, rooftops and other impervious surfaces [1,013 acres at both lakes]. The Maintained grasses class consisted of areas of “bright” vegetation easily identified in the imagery. For example, golf courses, baseball fields and manicured lawns typically presented a different visual signature in the imagery [1,556 acres at both lakes]. All other land covers were unknown, perhaps due to mixed signatures, and were placed in the “other” class [226 acres at both lakes]. Table 3-2 lists the current land cover at each lake based on the IKONOS imagery.

Table 3-2. Current Land Cover Between the Federal Property Line and the Conservation Pool Level

Land cover	Grapevine Lake		Lewisville Lake	
	acres	percent	acres	percent
Wooded	5,573	63.9	9,942	55.4
Herbaceous	2,452	28.1	5,434	30.3
Maintained grasses	243	2.8	1,312	7.3
Barren	381	4.4	633	3.5
Other	67	0.8	159	0.9
Totals	8,715	100	17,654	100

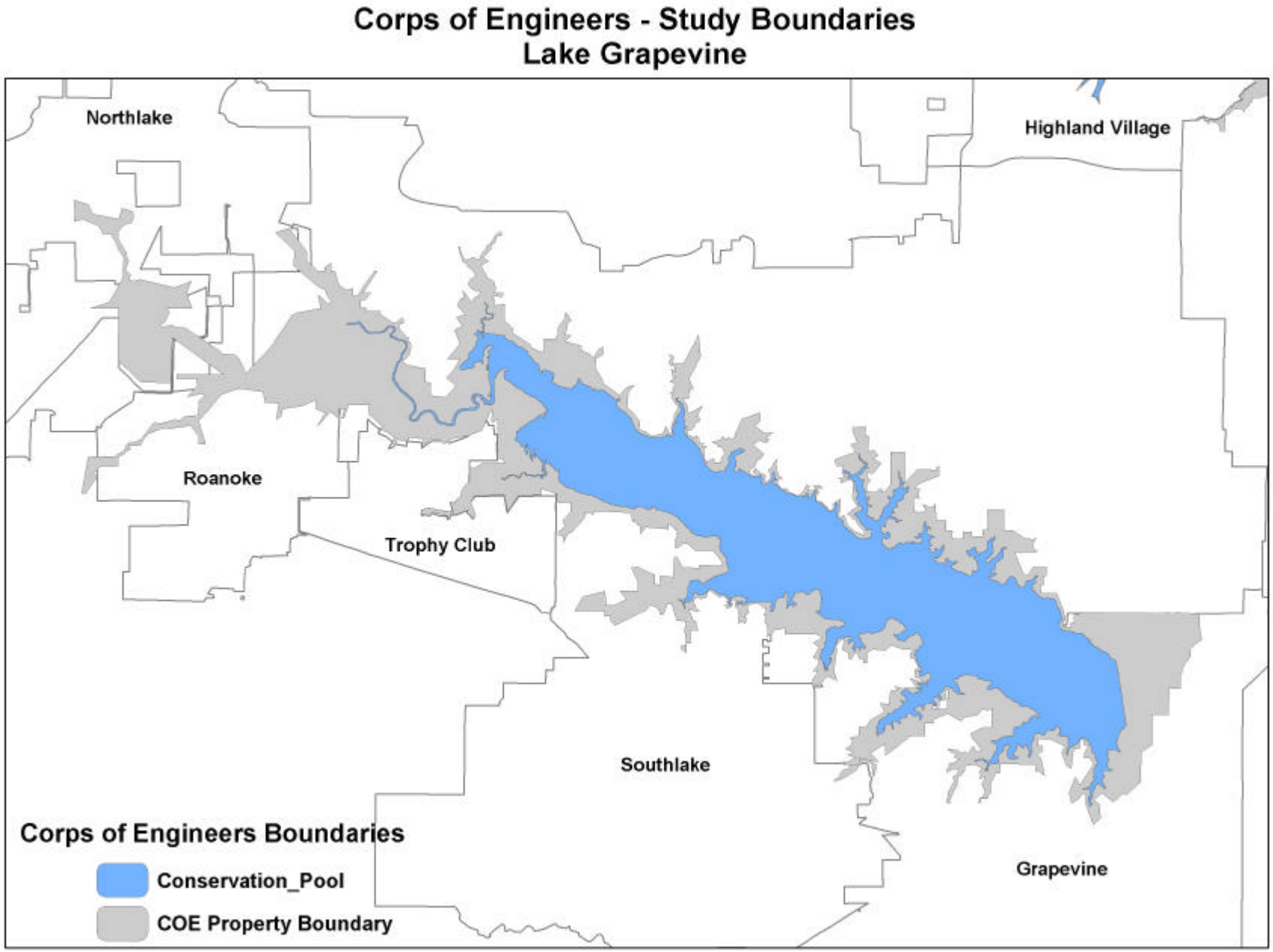


Figure 3-1. Study Area at Grapevine Lake.

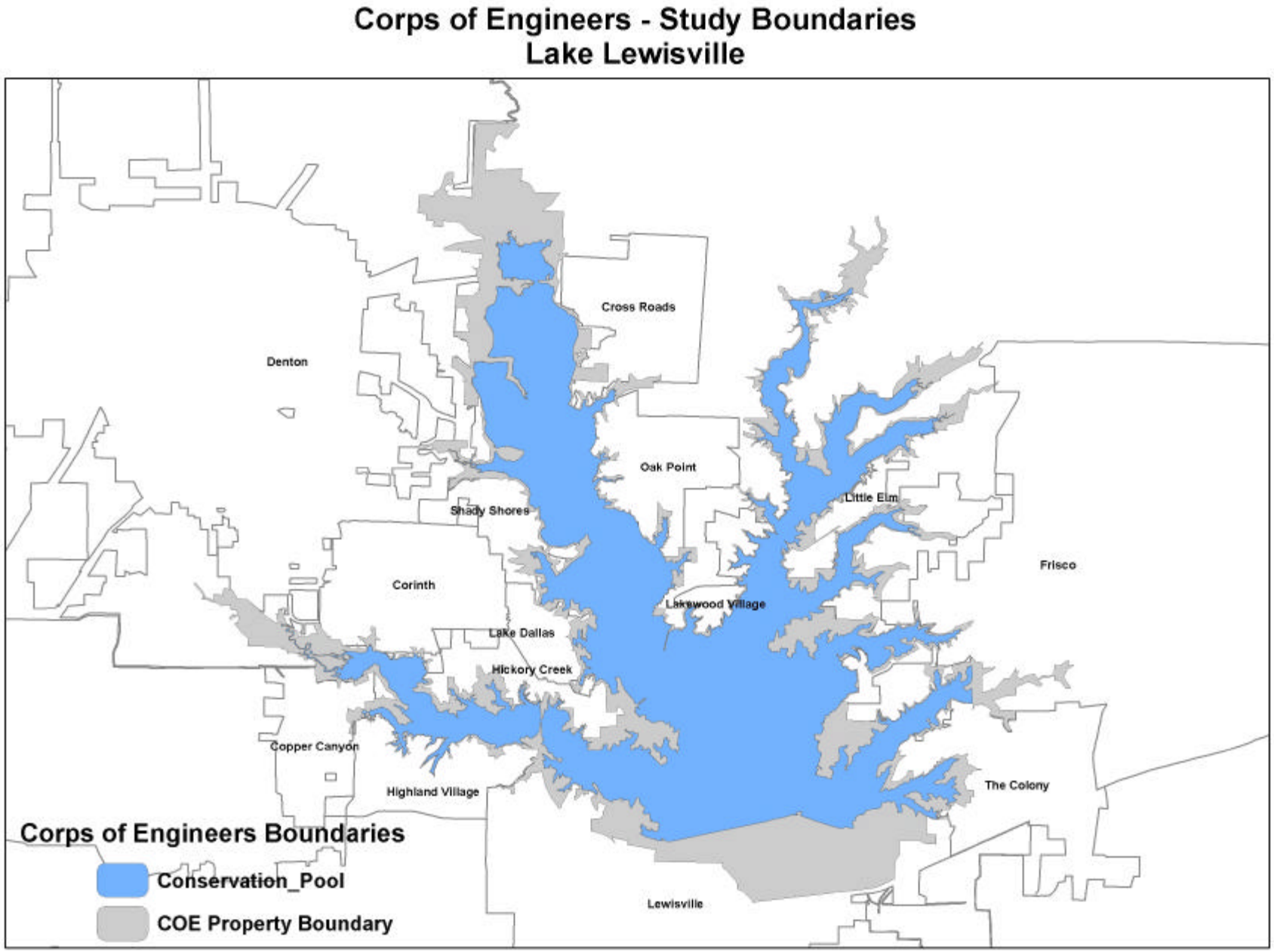


Figure 3-2. Study Area at Lewisville Lake

B. Physiography (Soils)

The geology of Lewisville Lake includes of two different formations: the Eagle Ford and the Woodbine. The Eagle Ford Formation, which consists of shale with minor sandstone interbeds, forms the bedrock for the eastern portion of the lake while the Woodbine Formation, composed of sandstone, shale and clay, is found in the western region. Grapevine Lake occurs on only one formation, the Woodbine.

Soil surveys conducted for Denton County (Ford and Pauls, 1980) classify the soils surrounding Lewisville Lake as five different categories. One soil type occurs on upland savannahs around the lake, the Birome-Gasil-Callisburg unit. The three units that occur on the upland prairies are Navo-Wilson, Branyon-Burleson-Heiden, and Altoga-Vertel-Ferris. The Frio-Ovan unit includes the soils found in the bottomlands. Characteristics of each soil type are shown in Table 3-3.

Table 3-3. Soil Types of Lewisville Lake

Soil Type	Depth	Slope	Composition	Permeability
Birome-Gasil-Callisburg[1]	Moderately Deep to Deep	1 to 15%	Loamy	Moderate to Slow
Navo-Wilson[1]	Moderately Deep to Deep	0 to 5%	Loamy	Very Slow
Branyon-Burleson-Heiden[1]	Moderately Deep to Deep	0 to 15%	Clayey	Very Slow
Altoga-Vertel-Ferris[1]	Moderately Deep to Deep	1 to 15%	Clayey	Moderate to Very Slow
Frio-Ovan[1]	Deep	< 1%	Clayey	Moderately Slow to Very Slow

1 = Information obtained from Denton County Soil Survey
2 = Information obtained from Tarrant County Soil Survey

Due to Grapevine Lake's dual residence in two different counties, soils on the northern side on the lake are classified by the Denton County Soil Survey (Ford and Pauls, 1980), while soils on the southern portion are classified by the Tarrant County Soil Survey (Ressel, 1981). Birome-Gasil-Callisburg and Crosstell-Gasil-Rader occur in the uplands around the lake while the bottomlands consist of soils belonging to the Frio-Ovan and Frio-Trinity units. Characteristics of Grapevine Lake soils are shown in Table 3-4.

Table 3-4. Soil Types of Grapevine Lake

Soil Type	Depth	Slope	Composition	Permeability
Birome-Gasil-Callisburg[1]	Moderately Deep to Deep	1 to 15%	Loamy	Moderate to Slow
Crosstell-Gasil-Rader[2]	Deep	0 to 8%	Loamy	Moderate to Slow
Frio-Ovan[1]	Deep	< 1%	Clayey	Moderately Slow to Very Slow
Frio-Trinity[2]	Deep	0 to 1%	Clayey	Moderately Slow to Very Slow

1 = Information obtained from Denton County Soil Survey
2 = Information obtained from Tarrant County Soil Survey

C. Water Quality

The Texas Commission on Environmental Quality (TCEQ), authorized to establish water quality standards, annually submits an assessment of the state's surface waters every two years to the U.S. Environmental Protection Agency (EPA). The *Texas Water Quality Inventory and 303(d) Lis*t identifies waters that do not meet the water quality standards set for their use (Table 3-5) under the Federal Clean Water Act. The surface waters in Texas have been separated into segments by the TCEQ in order to organize water quality data.

Lewisville Lake has been designated Segment 0823 of the Trinity River Basin, with classifications for Aquatic Life Use, Contact Recreation Use, General Use, Fish Consumption Use, and Public Water Use. Of the nine monitoring sites lie within the 23,280 acres of the Lewisville Lake water body area, the TCEQ cited two areas for nutrient enrichment concern in their 2002 List (Table 3-6).

Grapevine Lake has been designated Segment 0826 of the Trinity River Basin, with classifications for Aquatic Life Use, Contact Recreation Use, General Use, Fish Consumption Use, and Public Water Use. Out of ten monitoring sites for Grapevine Lake's 7,380 acre water body area, the TCEQ cited one area for concern in their 2002 List (Table 3-7).

Table 3-5. Water Quality Criteria for Lewisville and Grapevine Lakes

Segment Name	Chloride[1] (mg/L)	Sulfates[1] (mg/L)	Total Dissloved Solids[1] (mg/L)	Dissolved Oxygen[2] (mg/L)	pH Range[3] (SU)	Fecal Coliform (no./100ml)	Maximum Temperature (ØF)
Lewisville Lake	80	60	500	5	6.5-9.0	200	90
Grapevine Lake	80	60	500	5	6.5-9.0	200	93

[1] Maximum annual averages for segment

[2] Minimum 24-hour means at any site within segment

[3] Minimum and maximum values expressed in standard units

Table 3-6. Lewisville Lake Water Quality Exceedances

Monitoring Site	Location Size (acres)	Concern	Description of Concern	# of samples	# of exceedances
Hickory Creek	2,616	Nutrient Enrichment	Ammonia	25	11
Little Elm Creek	3,589	Nutrient Enrichment	Nitrate+Nitrate Nitrogen	10	4

Table 3-7. Grapevine Lake Water Quality Exceedances

Monitoring Site	Location Size (acres)	Use	Description of Concern	# of samples	# of exceedances
Middle portion of reservoir southeast of Walnut Grove Park	1,351	General Use	High pH	7	1

D. Wetlands

The definition most commonly used by Federal, state, and local agencies was developed by the United States Army Corps of Engineers (USACE), the United States Environmental Protection Agency (EPA), and the United States Fish and Wildlife Service (FWS):

> Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (Federal Register, Section 328.3(b), 1991; Federal Register, Section 230.4(t), 1991).

In addition, the definition requires that wetlands posses the following characteristics:

- Vegetation consisting of macrophyes adapted to areas with saturated soil conditions.
- Soil classified as hydric or possesses reducing characteristics.
- Hydrology that results in inundation either permanently or periodically with mean water depths less than 2 meters so that the soil is saturated to the surface at some time during the growing season.

Two types of wetlands can be found near lakes and reservoirs. Riverine wetlands refer to those wetlands within rivers or steams while fringe wetlands are located near large bodies of water that receive periodic and adequate two-way flow. For Lewisville and Grapevine Lakes, there is a small potential for fringe wetlands on the shoreline of the main body of the lake. There is an increased likelihood of encountering riverine wetlands as you move up the tributaries draining into the main lake bodies.

A wide variety of wildlife utilizes wetlands for reproductive, feeding, or nesting habitats. In addition, wetlands can protect water quality in lakes by removing nutrients and nonpoint source pollutants (e.g. herbicides), and can attenuate floodwaters. A common shrub found in the fringe wetlands is the common buttonbush (*Cephalanthus occidentalis*). It is an obligate wetland shrub, which not only helps stabilize shorelines, but also provides seeds consumed by several species of waterfowl (USDA, 2002).

E. Biological Resources

1. Vegetation

Lewisville and Grapevine Lakes fall within two vegetational areas of North Central Texas: the Eastern Cross Timbers and the Blackland Prairie (Diggs et al., 1999). The sandy, acidic soils resulting from the Woodbine bedrock allow for the of the dominant trees found in the Cross Timbers, post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*) (Dyksterhuis, 1948). These trees possess deep root systems that extend through the sandstone strata to access water, resulting in the dwarfed stature of most oaks in the Cross Timbers (Engle, 1997). Within and between the forests in undisturbed areas, the dominant native grass of the open savannahs is little bluestem (*Schizachyrium scoparius*). Other common grasses include Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and Sideoats grama (*Bouteloua curtipendula*), (Dyksterhuis, 1948).

The Blackland Prairie borders the eastern side the Cross Timbers and is characterized by deep, clayey soils mixed with sandy loams. In undisturbed areas, little bluestem (*Schizachyrium scoparius*) is the dominant climax grass and other common grasses include big bluestem (*Andropogon gerardii),* indiangrass (*Sorghastrum nutans*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsute*), switchgrass (*Panicum anceps*), and dropseed (*Sporobolus asper*) (Dyksterhuis, 1951). Native woody vegetation consists of post oak (*Quercus stellata),* cedar elm *(Ulmus crassifolia),* and bois d'Arc (*Maclura pomifera*) (Diggs et al., 1999).

Sampling performed in undisturbed areas of Denton County for the 1980 Soil Survey indicate the potential composition of plant species for major soil types found around Lewisville and Grapevine Lakes. Each table below shows the individual soil units in bold with the soil composition in italics as well as the percent

composition of dominant plant species for the following major soil types in Denton County (Appendix D): Birome-Gasil-Callisburg, Navo-Wilson, Branyon-Burleson-Heiden, Altoga-Vertel-Ferris, and Frio-Ovan.

As most of the lands around the lakes have been modified, a survey was conducted in 2004 to ascertain the current composition of vegetation around Lewisville and Grapevine Lakes (Tables 3-8 to 3-12). As noted in during field surveys associated with this environmental assessment, the beneficial climax grasses are mostly absent around Grapevine and Lewisville Lakes. The dominant trees found in the overstory include cedar elm (*Ulmus crassifolia*), post oak (*Quercus stellata*), hackberry (*Celtis laevigata*), Texas ash (*Fraxinus texensis*), honey mesquite (*Prosopis glandulosa*), and black willow (*Salix nigra*). Dominant vegetation of the understory consists of saplings of cedar elm, eastern red cedar (*Juniperus virginiana*), post oak, winged elm (*Ulmus alata*), hackberry, and Texas ash as well as green briar (*Smilax bona-nox*), Carolina snailweed (*Cocculus carolinus*), and poison ivy (Toxicodendron radicans). Japanese brome (*Bromus janponicus*), Scribner's panicum (*Dichanthelium oligosanthes*) and bermudagrass (*Cynodon dactylon*) are the dominant grasses.

Table 3-8. Typical Overstory Species in Lewisville and Grapevine Lake Region.

Common Name	Scientific Name	Common Name	Scientific Name
Box elder	*Acer negundo*	Bur oak	*Quercus macrocarpa*
Pecan	*Carya illinoensis*	Blackjack oak	*Quercus marilandica*
Black hickory	*Carya texana*	Shumard oak	*Quercus shumardii*
Southern hackberry	*Celtis laevigata*	Post oak	*Quercus stellata*
Buttonbush	*Cephalanthus occidentalis*	Black Oak	*Quercus velutina*
Flowering dogwood	*Cornus drummondii*	Black willow	*Salix nigra*
Hawthorn	*Crataegus engelmannii*	Western soapberry	*Sapindus saponaria*
Common persimmon	*Diospyros virginiana*	Gum bumelia	*Sideroxylon lanuginosum*
Texas ash	*Fraxinus texensis*	Coralberry	*Symphoricarpos orbiculatus*
Honey locust	*Gleditsia triacanthos*	Winged elm	*Ulmus alata*
Eastern redcedar	*Juniperus virginiana*	American elm	*Ulmus americana*
Chinese privet	*Ligustrum sinense*	Cedar elm	*Ulmus crassifolia*
Osage orange	*Maclura pomifera*	Red elm	*Ulmus rubra*
Red Mulberry	*Morus rubra*	Viburnum	*Viburnum*
Eastern cottonwood	*Populus deltoides*	Hercules' club	*Zanthoxylum clava-herculis*
Honey mesquite	*Prosopis glandulosa*		

2. Wildlife

Mammals common to the Lewisville and Grapevine Lake areas include the Opossum (*Didelphis virginiana*), Evening Bat (*Nycticeius humeralis*), Nine-banded Armadillo (*Dasypus novemcinctus*), American Beaver (*Castor americana*), White-footed Mouse (*Peromyscus leucopus*), Hispid Cotton Rat (*Sigmodon hispidus*), Coyote (*Canis latrans*), Raccoon (*Procyon lotor),* Eastern Fox Squirrel (*Sciurus niger)*, Eastern Cottontail (*Sylvilagus floridanus*), Plains Harvest Mouse (*Reithrodontomys montanus*), White Tail Deer (*Odocoileus virginianus*) bobcat (*Felis rufus*), and Striped Skunk (*Mephitis mephitis).* Other species may have ranges that could bring them in or around the lakes areas. All potential species in Denton and Tarrant counties (Davis and Schmidly, 1994) are listed in Appendix E.

Birds common to the Lewisville and Grapevine Lake areas include the Double-crested Cormorant (*Phalacrocorax auritus),* Canada Goose (*Branta americana),* American Wigeon (*Anas americana),* Gadwall (*Anas strepera),* Green-winged Teal (*Anas crecca),* Mallard (*Anas platyrhynchos),* Blue-winged Teal (*Anas discors),* Northern Shoveler (*Anas clypeata),* Ring-necked Duck (*Aythya collaris),* Lesser Scaup (*Aythya affinis),* Bufflehead (*Bucephala albeola),* Little Blue Heron (*Egretta caerulea),* Great Blue Heron (*Ardea herodias),* Great Egret (*Ardea alba),* Cattle Egret (*Bubulcus ibis),* Turkey Vulture (*Cathartes aura),* Red-tailed Hawk (*Buteo jamaicensis)* American Kestrel (*Falco sparverius),* American Coot (*Fulica americana),* Killdeer (*Charadrius vociferous),* Ring-billed Gull (*Larus delawarensis),* Forster's Tern (*Sterna forsteri),* Rock Dove

Table 3-9. Typical Understory[1] of Lewisville and Grapevine Lake Region

Common Name	Scientific Name	Common Name	Scientific Name
Peppervine	*Ampelopsis arborea*	Japanese Honeysuckle	*Lonicera japonica*
Trumpet vine	*Campsis radicans*	Virginia creeper	*Parthenocissus quinquefolia*
Ballonvine	*Cardispermum halicacabum*	Blackberry	*Rubus* sp.
Clematis	*Clematis* sp.	Greenbriar	*Smilax bona-nox*
Carolina snailseed	*Cocculus carolinus*	Poison ivy	*Toxicodendron radicans*
Dodder	*Cuscuta* sp.	Grapevine	*Vitis* sp.
Pitted Morning Glory	*Ipomoea lacunosa*	Mexican Plum	*Prunus mexicana*
Sumac	*Rhus coriaria*	Chickasaw Plum	*Rosaceae Prunus*
Coral Honeysuckle	*Lonicera sempervirens*	Eastern Redbud	*Cercis canadensis*

[1] All saplings (< 5 cm diameter at breast height (dbh) and greater than 1 meter in height) from Table 3-9 also classified as Understory. (For example, buttonbush, Chinese privet, coralberry and Viburnum)

Table 3-10. Typical Grasses of Lewisville and Grapevine Lake Region

Common Name	Scientific Name	Common Name	Scientific Name
Couch grass	*Agropyron repens*	Redroot flatsedge	*Cyperus erythrorhizos*
Purple three-awn	*Aristida purpurea*	Scribner's panicum	*Dichanthelium oligosanthes*
Wild oats	*Avena fatua*	Canada wildrye	*Elymus canadensis*
King ranch bluestem	*Bothriochola ischaemum*	Red lovegrass	*Eragrostis secundiflora*
Little quakinggrass	*Briza minor*	Little barley	*Hordeum pusillum*
Rescuegrass	*Bromus catharticus*	Rush	*Juncus sp.*
Japanese chess	*Bromus japonicus*	Witchgrass	*Panicum capillare*
Buffalo grass	*Buchloe dactyloides*	Western wheatgrass	*Pascopyrum smithii*
Ravenfoot sedge	*Carex crus-corvi*	Dallisgrass	*Paspalum dilatatum*
Frank's sedge	*Carex frankii*	Indiangrass	*Sorghastrum nutans*
Woolyfruit sedge	*Carex lasiocarpus*	Johnsongrass	*Sorghum halepense*
Leavenworth's sedge	*Carex leavenworthii*	Tall dropseed	*Sporobolus asper*
Hop sedge	*Carex lupalina*	Smutgrass	*Sporobolus indicus*
Coastal sandbur	*Cenchrus spinifex*	Texas dropseed	*Sporobolus texanus*
Inland sea oats	*Chasmanthium latifolia*	White tridens	*Tridens albescens*
Bermudagrass	*Cynodon dactylon*	Sixweeks fescue	*Vulpia octoflora*

(*Columba livia),* Mourning Dove (*Zenaida macroura),* Chimney Swift (*Chaetura pelagica),* Red-bellied Woodpecker (*Melanerpes carolinus),* Scissor-tailed Flycatcher (*Tyrannus forficatus),* Blue Jay (*Cyanocitta cristata),* American Crow (*Corvus brachyrhynchos),* American Robin (*Turdus migratorius),* Northern Mockingbird (*Mimus polyglottos),* European Starling (*Sturnus vulgaris),* Purple Martin (*Progne subis),* Barn Swallow (*Hirundo rustica),* Carolina Chickadee (*Poecile carolinensis),* House Sparrow (*Passer domesticus),* American Goldfinch (*Carduelis tristis),* Yellow-rumped Warbler (*Dendroica coronata),* Song Sparrow (*Melospiza melodia),* Dark-eyed Junco (*Junco hyemalis),* Savannah Sparrow (*Passerculus sandwichensis),* Dickcissel (*Spiza americana),* Northern Cardinal (*Cardinalis cardinalis),* Red-winged Blackbird (*Agelaius phoeniceus)* Great-tailed Grackle (*Quiscalus mexicanus),* Common Grackle (*Quiscalus quiscula),* Northern Bob-white (*Colinus virginianus*), Carolina Wren (*Thryothorus ludovicianus*) and Brown-headed Cowbird

(*Molothrus ater).* Other species may have ranges that could bring them in or around the lakes areas, but do not common residents. All potential species of Denton and Tarrant counties (Pulich, 1988; Tveten, 1996) are listed in Appendix E.

Herpetofuna common to the Lewisville and Grapevine Lake areas include the Red-eared Turtle (*Trachemys scripta elegans*), Common Snapping Turtle (*Chelydra americana),* Mississippi Mud Turtle (*Kinosternon subrubrum hippocrepis),* Ground Skink (*Scincella lateralis),* Texas Spiny Lizard (*Sceloporus olivaceus),* Five-lined Skink (*Eumeces fasciatus),* Texas Brown Snake (*Storeria dekayi texana),* Western Ribbon Snake (*Thamnophis proximus proximus),* Rough Earth Snake (*Virginia striatula),* Rough Green Snake (*Opheodrys aestivus),* Western Cottonmouth (*Agkistrodon piscivorus leucostoma),* Diamondback Water Snake (*Nerodia rhombifer rhombifer),* Small-mouthed Salamander (*Ambystoma texana),* Western Lesser Siren (*Siren intermedia nettingi),* Southern Leopard Frog (*Rana utricularia),* Bullfrog (*Rana catesbeiana*),and Green Treefrog (*Hyla cinerea).* Other species may have ranges that could bring them in or around the lakes areas. All potential species of Denton and Tarrant counties (Garrett and Barker, 1987; Tennant, 1985) are listed in Appendix E.

3. Wildlife Habitat

In general, the fauna of Lewisville and Grapevine Lakes can be assigned to three different habitat types: wooded (forested and shrub dominated habitats), herbaceous (non-wooded, non-mowed areas such as native and invasive grasslands), maintained grasses (mowed landscaping varieties) (Appendix E). Some species may utilize different habitats for different purposes. For example, the mink (*Mustela vison*) dens underneath trees in bottomland forests, but hunts largely in aquatic habitats (Davis and Schmidly, 1994). The fauna may be further separated into guilds based on the vegetation cover utilized by the animal within the main habitat types. For wooded areas, the vegetation classes consist of the arboreal habitat of the overstory and the brushy habitat of the understory. For grasslands, the classes are short-grass and tall-grass.

The Wildlife Habitat Appraisal Procedure (WHAP), developed by the Texas Parks and Wildlife Department (Frey, 1995), was applied at both Grapevine and Lewisville Lakes to determine existing habitat quality. This procedure is based upon measurements of existing key vegetation components that contribute to the ecological condition of the area, and results in an index of overall suitability for wildlife. Key habitat variables measured or estimated in the field include: site potential for woody and herbaceous plant production; age of existing vegetation; relative abundance of the habitat type and its value to wildlife; diversity of occurring woody vegetation; vertical stratification of vegetation canopy cover; relative abundance or scarcity of dens and refuge sites; and availability of browse and herbaceous materials. These measurements are made at multiple sample plots, and converted to a Habitat Quality Scores, which are typically averaged for each habitat type. The scores theoretically range from 0 (no habitat quality) to 1.0 (optimum habitat quality). Finally, the Habitat Quality score is multiplied by the number of acres of each habitat type, yielding a number of Habitat Units for the study area. For example, if there are 300 acres of forested lands, and the average Habitat Quality score is 0.65, then there are 195 Habitat Units of forested land in the study area. Habitat Units can be thought of as representing the amount of equivalent optimum habitat that occurs in the study area. In the above example, the 300 acres of forested lands in the study area provide the equivalent amount of wildlife habitat as 195 acres of optimum forest habitat.

Between 10 May 2004 and 21 May 2004, a total of 32 sample plots in wooded areas, and 33 sample plots in herbaceous/grasslands areas were measured at Grapevine and Lewisville Lakes (See Appendix G for data). Sites were selected with a stratified pseudo-random strategy: sites considered to have lower levels of human disturbance (i.e., higher quality sites), moderate levels of human disturbance, and higher levels of human disturbance (i.e., lower quality sites). Table 3-11 indicates that wooded sites sampled in low disturbance had average Habitat Quality scores of 0.75 at Grapevine Lake and 0.65 at Lewisville Lake. Herbaceous/grasslands sites sampled in low disturbance areas had average scores of 0.44 and 0.42 at Grapevine and Lewisville Lakes, respectively. Scores dropped substantially in high disturbance areas. Wooded sites sampled in high disturbance areas had average scores of 0.50 at Grapevine Lake and 0.43 at Lewisville Lake, an approximate average drop of 34% in habitat quality from low disturbance areas. Herbaceous/ grasslands sites sampled in high disturbance areas had average scores of 0.29 and 0.30 at Grapevine and Lewisville Lakes, respectively, an approximate average drop in 31% from low disturbance areas.

In total, the approximate 26,195 acres in the Grapevine and Lewisville Lake study area currently provide approximately 14,622 Habitat Units (averaging approximately 0.56 Habitat Units per acre). These results

indicate that the wildlife quality of the Federal lands surrounding Grapevine and Lewisville Lakes are only, on average, moderate. While there are several stands of high quality habitat, human impact appears to be the primary limiting or controlling factor on habitat quality across most of the study area. Most of these sites were in an early transitional stage; there were few or no climax communities present. The forested sites were dominated for the most part by just a few species, mostly cedar elm, hackberry, and mesquite. The age structure of most of the forested sites indicated that they are nearing the end of the life cycle for the dominant trees, and indeed, many dead or dying trees were observed. The sapling layer at numerous sites contained oaks and elms, which indicates the possibility for a more higher quality forest habitat within the next couple of decades, if the level of impact is reduced or reversed. Most of the grasslands were dominated by pioneer weedy species, predominantly invasive grasses and annual forbs, such as Japanese brome and ragweed.

Table 3-11. WHAP results for existing conditions at Grapevine and Lewisville Lakes.

Lake	Level of Human Disturbance	Wooded Habitat[1]			Herbaceous & Grasslands Habitats[2]		
		acres	HQ	HUs	acres	HQ	HUs
Grapevine	Lower (habitat zone)	5,362	0.75	4,022	2,370	0.44	1,043
	Higher (mow zone)	210	0.50	105	81	0.29	23
Lewisville	Lower (habitat zone)	9,158	0.65	5,953	5,004	0.42	2,102
	Higher (mow zone)	783	0.43	337	430	0.30	129

[1] Wooded Habitat includes areas dominated by trees and areas dominated by shrubby vegetation (a single class in the classified satellite imagery) [unobserved mowed areas may exist underneath the canopy of the trees].

[2] Herbaceous/Grassland Habitat includes areas dominated by native and invasive grasses that are not mowed, as well as areas dominated by grasses that are frequently mowed (two classes in the classified satellite imagery).

4. Threatened and Endangered Species

The Endangered Species Act of 1973 (PL 93-205) and the amendments of 1988 (PL 100-578) requires all Federal agencies to implement protection programs for the preservation of threatened and endangered species. Although the potential ranges of some threatened or endangered species coincide with the Lewisville and Grapevine Lake areas, no known Federally or State listed species occupy permanent habitats in either area. Currently, five federally listed species may be transient inhabitants of the lake areas while migrating through Denton and/or Grapevine Counties. These species are the Whooping Crane (*Crus americana*), the Piping Plover (*Charadrius melodus*), the Interior Least Tern (*Sterna antillarum athalassos*), and the Black-capped Vireo (*Vireo atricapillus*). The only species indigenous to either county is the bald eagle (*Haliaeetus leucocepalus*). Currently, none of these species are known to occur in the Lewisville or Grapevine Lake areas.

F. Air Quality

The U.S. Environmental Protection Agency (EPA) is responsible for national air quality regulation and authorizes the Texas Commission on Environmental Quality (TCEQ) to monitor and enforce these standards. To comply with the Federal Clean Air Act of 1970 and the Clean Air Act Amendments of 1977 and 1990, the EPA implemented the National Ambient Air Quality Standards (NAAQS) to ensure protection of public health and the environment from known or anticipated effects of ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, particulates, and lead (Table 3-12). The EPA classifies air quality regions as “nonattainment” areas when the NAAQS are exceeded for a particular pollutant.

As of May 5, 2004, both Denton and Tarrant Counties were designated attainment areas for carbon monoxide, sulfur dioxide, nitrogen dioxide, particulates, and lead. However, they have been designated serious nonattainment areas for ozone’s 1-hour and 8-hour averaging times.

Table 3-12. National Ambient Air Quality Standards (NAAQS)

Pollutant	National Standards[a]		Averaging Times
	Primary	Secondary	
Carbon Monoxide	9 ppm (10 mg/m^3)	None	8-hour[1]
	35 ppm (40 mg/m^3)	None	1-hour[1]
Lead	1.5 µg/m^3	Same as Primary	Quarterly Average
Nitrogen Dioxide	0.053 ppm (100 µg/m^3)	Same as Primary	Annual (Arithmetic Mean)
Particulate Matter (PM_{10})	50 µg/m^3	Same as Primary	Annual[2] (Arith. Mean)
	150 ug/m^3		24-hour[1]
Particulate Matter ($PM_{2.5}$)	15 µg/m^3	Same as Primary	Annual[3] (Arith. Mean)
	65 ug/m^3		24-hour[4]
Ozone	0.08 ppm	Same as Primary	8-hour[5]
	0.12 ppm	Same as Primary	1-hour[6]
Sulfur Oxides	0.03 ppm	-------	Annual (Arith. Mean)
	0.14 ppm	-------	24-hour[1]
	-------	0.5 ppm (1300 ug/m^3)	3-hour[1]

[a] Primary Standards are the levels of air quality necessary to protect public health.
Secondary Standards are the levels of air quality necessary to protect public welfare.

[1] Not to be exceeded more than once per year.

[2] Expected annual arithmetic mean must not exceed 50 ug/m^3.

[3] 3-year average of the annual arithmetic mean must not exceed 15 ug/m^3.

[4] 3-year average of the 98th percentile of 24-hour concentrations must not exceed 65 ug/m^3.

[5] 3-year average of the fourth-highest daily maximum 8-hour average must not exceed 0.08 ppm.

[6] (a) expected number of days/year with max hourly average concentrations above 0.12 ppm is c 1,
(b) The 1-hour standard is applicable to all areas notwithstanding the promulgation of 8-hour ozone standards

G. Noise

Noise sources around the lake include activities generally associated with parks and recreational areas, residential areas and schools, activities around commercials areas, and noise from vehicles, watercraft, wind, and wildlife. In the Lewisville Bridge Crossing Environmental Overview Study of January 23, 1995, exterior ambient noise measurements were recorded and evaluated. The measurements ranged from 50 dBA L_{eq} to 66 dBA L_{eq} (L_{eq} represents the average sound level over a period of time). This range is typical for the noise levels found in quiet suburban to noisy urban areas (Table 3-13).

Table 3-13. Typical Day-Night Noise Levels in Residential Areas

Residential Type	Typical Range of L_{dn}[1], dB	Average L_{dn}, dB	Average census tract population density, no. of people/mi^2
Quiet suburban	48-52	50	630
Normal suburban	53-57	55	2,000
Urban	58-62	60	6,300
Noisy urban	63-67	65	20,000
Very noisy urban	68-72	70	63,000

[1] Day-night average noise sound level

H. Recreation and Open Spaces

Approximately 1.4% of Texas lands are owned by the Federal government, as compared to the national average of just over 24%. The amount of Federal lands ranges from 0.2% (Iowa) to just over 77% (Nevada). There are only 12 states with less of a percentage of Federal lands than Texas, making public lands in Texas a highly valued resource (BLM 1997). Federal lands at Lewisville and Grapevine Lakes offer a variety of opportunities for recreational activities, such as parks, hike and bike trails, lake access areas, marinas, and hunting areas. Recreational lands classified as high intensity recreation include park lands and marinas, while those classified as low intensity recreation include the habitat zone, where hiking and nature viewing are encouraged. For a more detailed description, please refer to the Lewisville Lake Programmatic Environmental Assessment (Carter and Burgess, 1999) and the Grapevine Lake Master Plan Supplement (USACE, 2002). Currently at Grapevine and Lewisville Lakes, USACE maintains lands for recreational purposes (approximately 9,061 acres), and for wildlife management (approximately 15,344 acres for environmental stewardship) purposes.

I. Socioeconomic Conditions

North Central Texas Council of Governments (NCTGOC) composed of 16 counties, was established to assist in planning for local governments. The NCTGOC the region experienced a 29.12% growth rate for the area from 1990 to 2000 and these rapid rates of expansion require coordination between the different counties so that public services keep up with demand. Both Lewisville and Grapevine Lakes serve as water supplies for several counties in the area, and Denton County alone experienced a population increase of 58.29% from 1990 and 2000 (Table 3-12). Population projections estimate a further increase of 154% for Denton County and 60% for Tarrant County (Table 3-14).

Table 3-14. Population Growth in Denton and Tarrant County

County	Population in 1990	Population in 2000	Percent Growth '90 to '00	Estimated Population in 2030	Percent Growth '00 to '30
Denton	273,525	432,976	58.29%	1,085,300	154.00%
Tarrant	1,170,103	1,446,219	23.60%	2,291,700	60.00%

Pressure for development around Grapevine and Lewisville Lakes has continued from the time of their construction. For example, Denton County, is the eighth most populous county in the state. Cities around Lewisville Lake include Denton, the county seat, Lewisville and Carrollton, Frisco and numerous other smaller towns. Cities around Grapevine Lake include Flower Mound, Trophy Club, Southlake and Grapevine and other smaller towns. While population growth has slowed somewhat from the extreme levels of the late 1980's, the area continues to experience strong growth in population and in its economic base. For example, Denton County's tax base increased from $10.3 billion in 1990 to over $22 billion in 2001. Job additions in Denton County have continued in both manufacturing and service industries. Denton County's September 2001, unemployment rate was 3.20% (compared to the 5.0% statewide rate and the 5.0% national rate). During the 2001 year, Denton County had over $1.7 billion in new property added to the tax rolls. This was the highest amount of new construction in Denton County ever recorded in one year. In 2001, for the fifth straight year, over 4,000 new housing starts were recorded in the County. Tarrant County has experienced similar rates of increase, and the NCTCOG projects that total households will increase in Denton and Tarrant Counties from 701,800 in 2000 to 1,268,700 in 2030, an 81% increase. In other words, development pressure around Grapevine and Lewisville Lakes is high.

Adjacent landowners have specific concerns related to socioeconomics. These involve: (1) risks, costs and efforts that some adjacent landowners might incur to reduce or remove species they find undesirable (e.g. rodents and snakes) from their private property; (2) the costs associated with property loss if wildland fires damage or destroy private property; (3) access for adjacent landowners to the shorelines of the lakes; (4) the effect activities conducted on Federal lands might have on their own property values; and, (5) a desire by some adjacent landowners who have been mowing/underbrushing beyond the current allowable limits to be granted "grandfathered rights", and continue the mowing and underbrushing activities to which they have grown accustomed.

(1) While there are no data available for estimating the costs and efforts currently expended by adjacent landowners for controlling undesirable species on their private property, it is known that the property line around the two lakes is approximately 351 miles long, which offers at least a relative view of these risks, costs and efforts. Preventing undesirable species from crossing a 351-mile boundary involves substantial efforts, perhaps more than can actually be accomplished. A letter received by USACE included photos of a killed snake near their home, approximately 250 feet away from the Federal property line. The snake apparently crossed 250 feet of mowed grass. USACE is charged with providing wildlife habitat and outdoor recreation and it would not meet the underlying purpose and need being addressed in this environmental assessment (to manage and conserve natural resources while providing quality public outdoor recreation experiences for present and future generations) if more than 250 feet of a mowing/ underbrushing zone is required to adequately buffer adjacent landowners from undesirable species.

(2) There is a risk from wildland fires at Grapevine and Lewisville Lakes, especially when drought conditions prevail. USACE reported that in April of 1980 an approximate 1090-acre fire occurred along the Elm Fork channel from Highway 380 south to include most of the "delta" formed at the upper end of Lewisville Lake. The fire began on the west side of the river channel and burned from Highway 380 for a distance of about 8,000 feet. Then the fire expanded to both sides of the river and burned the fairly wide delta that was woodland, dominated by cottonwood and willow (now it is a buttonbush delta). The shoreline fronting what was then known as the "Alvin Reed Camp" subdivision

was burned with very intense fire. The lake level at the time was 507 feet msl (conservation pool elevation at the time was 515 feet msl) and the river bottom was dominated by dead, dry, 8-10 foot high giant ragweed. There was likely heavy tree mortality along the riverbanks with a recommendation to harvest the badly burned cottonwood and willow, but there was no report of damage to private property. Another 10- to 20-acre fire occurred on the Lewisville Lake Environmental Learning Area grounds (an area below the Lewisville Lake dam) in the late summer or fall of 1998. Apparently a spark from a railroad track may have started it and then a wooden electric utility pole burned and fell over causing electrical arcing and further spreading of the fire. Several wild fires have occurred over time at Grapevine Lake, but none have occurred over the last several years.

(3) Current guidelines allow adjacent landowners to apply for a permit from USACE to develop and maintain a pedestrian access path to the shoreline. Currently, approximately 182 access path permits are active, but many more unpermitted paths exist. For this environmental assessment, 3 pedestrian access path scenarios were considered: no access paths, individual access paths, and community access paths. These scenarios were studied in light of one of the underlying needs stated in Chapter 1 of this environmental assessment: to provide for long-term public access to, and use of, natural resources.

(4) Several comments have been received from adjacent landowners alleging that implementing the preferred alternative could create an economic effect of reduced property value of lands adjacent to project lands. As stated in Department of Army Environmental Regulation ER 1130-2-406 (Shoreline Management at Civil Works Projects) Section 4.e, “The issuance of a private shoreline use permit does not convey any real estate or personal property rights or exclusive use rights to the permit holder.” Thus, property owners adjacent to project lands do not have the right to use or alter the real property of the United States for private purposes. The claim of reduced property values because of reduced or increased mowing/underbrushing that is allowed on government property is highly speculative and subjective. Analysis is unavailable to substantiate the claim or to establish a reasonable expectation that property values will diminish. Existing variability in land value due to locations and improvements make it impossible to quantify any potential difference that might be associated with mowing/ underbrushing government property. Given the nature of the area and the relatively sporadic and varied nature of adjacent landowners mowing, changes in the mowing guidelines would not be expected to produce a reasonably foreseeable adverse or measurable impact on the economic value of properties adjacent to project lands.

(5) Comments received at the scoping workshops indicated that some adjacent landowners had been mowing and underbrushing beyond the specified guidelines for many years with no apparent effort by USACE to curtail the mowing. Some of these landowners expressed a desire to allow this mowing to continue by virtue of grandfather rights or privileges. USACE recognizes that such mowing has been ongoing in several areas, primarily at Lewisville Lake. Nonetheless, USACE considers this mowing to be unauthorized and, in several areas, exceeding the intent of the Shoreline Management Plans (SMP’s) for Grapevine and Lewisville Lakes. The Grandfather Rights provision in the SMP’s pertains only to docks and other private floating facilities but does not pertain to vegetation alteration permits. Neither the SMP’s, nor any subsequent guidelines brochures provided to adjacent landowners, authorized unlimited mowing or underbrushing of Federal land. The intent of the SMP’s, since publication in 1976, and as stated in Section VII of each SMP is to allow “limited” landscaping and vegetation modification, including mowing and underbrushing. The SMP’s further state that “permits issued for landscaping does not contain any special right or privilege”. Consequently, USACE maintains that grandfatherable rights to mow beyond 25 feet at Grapevine and 50 feet at Lewisville have never been granted. Mowing and/or underbrushing beyond the 25- and 50-foot zones within narrow shoreline variance areas, as contemplated in Alternative 7, is considered by USACE to be responsive to public interest with only negligible environmental impact, but does not consider mowing and/or underbrushing in narrow shoreline variance areas to be a grandfatherable privilege.

Chapter 4: Impacts of Proposed Action and Alternatives

Estimating the impacts of each alternative is based largely on the relative width of the mowing/underbrushing zone versus the habitat zone in each alternative. From a programmatic view (i.e. combining Grapevine and Lewisville Lakes into a single analysis), there are a total of approximately 26,669 acres between the Federal property line and the conservation pool elevation. Each alternative analyzed involved a different combination of these two zones, but always totaled to 26,669 acres. While more than twenty alternatives were initially analyzed, they fall into 3 major categories: the status quo alternative (i.e. continuing the current adjacent landowner activities guidelines); those that allow less mowing/underbrushing than current guidelines; and those that allow more mowing/underbrushing than current guidelines. A sub-category of alternatives included a conceptual analysis of either continuing with the current access path guidelines (each adjacent landowner can obtain a permit to maintain an access path to the water's edge) or reducing the number of access paths by allowing only "community" access paths where neighborhoods share a common access path. This analysis had to be conceptual, since there is no programmatic method to determine the specific number of individual or community access paths that might eventually exist at the two lakes. While that specific number can be considered incomplete or unavailable, it did not prevent a reasoned choice among alternatives since for each alternative, a conceptual analysis can forecast the effects of many individual access paths versus fewer community paths. Additionally, any new pedestrian access paths would have to be community access paths authorized by written permit, thereby allowing USACE to account for the number of permitted access paths.

Alternative 1, the no action or status quo alternative, has approximately 1,782 acres in the mowing/ underbrushing zone (some, but not all land in this zone is frequently mowed and underbrushed, whether a permit has been issued or not). The mowing/underbrushing zone represents approximately 6.4% of the study area. Additionally, there are approximately 24,956 acres in the habitat zone, that area between the mowing/underbrushing zone and conservation pool elevation (93.6%). Some of this area, while outside the permitted mowing/underbrushing zone, is frequently mowed and underbrushed. Finally, the status quo alternative allows adjacent landowners to request a permit for a community access path.

Alternatives 2, 3 and 4, the no mowing/underbrushing, the fire safety, and the minimum habitat buffer alternatives, would both result in less mowing/underbrushing activities than currently allowed. These alternatives would reduce the allowable mowing/underbrushing area to 0 acres of the study area under alternative 2, and approximately 1,012 acres of the study area (3.8%) under alternative 3. Alternatives 2 and 3 also allow adjacent landowners to request a permit for a community access path.

Alternatives 5, 6 and 7, the expanded mowing/underbrushing, mow all, and narrow shoreline variance alternatives, would result in more mowing/underbrushing activities than currently allowed. These alternatives would increase the current allowable mowing/underbrushing area (1,782 acres or 6.8% of study area) to 3,309 acres (12.4%) of the study area under the expanded mow alternative, to 26,669 acres (100%) of the study area under the mowing/underbrushing all areas alternative, or to 1,926 acres (7.2%) of the study area under the narrow shoreline variance alternative. These alternatives also allow adjacent landowners to request a permit for a community access path.

Most of the environmental effects analyzed in this environmental assessment, but not all, are proportional to the amount of mowing/underbrushing versus habitat area allowed under each alternative (see Table 4-1).

Table 4-1. Acreage and percent of study area within mowing/underbrushing zone and habitat zone for each alternative.

	Area, acres		Percent	
	Zone 1: mow zone	Zone 2: habitat zone	Zone 1: mow zone	Zone 2: habitat zone
Alternative 1 No action	1,782	24,413	6.8%	93.2%
Alternative 2 No mow	0	26,195	0.0%	100.0%
Alternative 3 Fire safety	1,063	25,133	4.1%	95.9%
Alternative 4 Minimum buffer	1,742	24,453	6.7%	93.3%
Alternative 5 Expanded mow	3,369	22,826	12.9%	87.1%
Alternative 6 Mow all	26,195	0	100.0%	0.0%
Alternative 7 Narrow shoreline variance	1,926	24,269	7.4%	92.6%

A. Potential land use and land cover changes

A result of an earlier programmatic environmental assessment for Lewisville Lake (U.S. Army Corps of Engineers, 1999) was that USACE determined that there would be no net gain or loss of any land use category at the lake. Grapevine Lake is managed in the same manner. None of the alternatives examined in this environmental assessment are proposing to change any land use classifications, nor would they affect any land use classifications. The alternatives considered in this environmental assessment would affect only the actions conducted in the Natural Resource Management Areas of both lakes. Lands designated as wildlife management areas account for approximately 59% of the total lands at Grapevine and Lewisville Lakes while designated recreational lands account for approximately 35%. Property owners adjacent to parks would still have to apply for a permit for any activities on Federal lands on a case-by-case basis so that USACE could ensure that permits did not interfere with park operations as required by regulations.

Figures 4-1 and 4-2 provide a representation of existing land cover at both lakes. The primary effects on land cover are based upon the width of the mowing/underbrushing and the habitat zones. Each alternative has a set mowing width (from 0 to 100 feet) except for the no mow and mow all alternatives. Table 4-2 provides acreages of each land cover class (woody, herbaceous, maintained grasses, barren and other) in each zone (mowing/underbrushing, zone 1; habitat management, zone 2) for each alternative.

B. Physiography (soils)

1. Activities in the Mowing/Underbrushing Zone

The minimum amount of leaf area necessary to ensure a healthy root system is called the basal zone of the grass, which provides the minimum area needed to photosynthesize nutrients for the roots (Owen et al., 1998). Under chronic mowing, the basal zone of grasses is frequently compromised and the plant cannot produce an adequate supply of food (Turner et al., 1993). Close-cropping seriously retards root development

(Phillips Petroleum Company, 1963), which leads to inadequate stabilization of soil particles, and sheet-and-rill soil erosion across land surfaces and shoreline erosion at the land-water interface can occur (Morgan, 1979). Observations along the shoreline of both Grapevine and Lewisville Lakes confirms that in areas with little or no vegetation, erosion is most severe. However, there are areas that have been cultivated into Bermuda grass lawns, and regularly mowed all the way to the shoreline (also noted in public workshops and site visits), that are not eroding. This is mainly due to the location of these types of areas. Most of these Bermuda grass lawns are located in protected coves or out of the prevailing winds, where erosion would be minimal. Sheet-and-rill erosion is likely to be higher in these Bermuda grass areas than would occur under the native vegetation of Cross Timbers or Blackland Prairies. None-the-less, the most erosion resistant shorelines at both lakes were those that have substantial amounts of tall vegetation such as buttonbush (*Cephalanthus occidentalis*) that grows at the shoreline, normally a few feet out into the water. This type of shoreline vegetation, several feet tall with dense canopy and stiff branches can break erosive wave action even when the lake fluctuates over several feet in elevation and has much deeper roots than mowed Bermuda grass.

If herbicides are allowed to control undesirable species, such as poison ivy (*Rhus radicans*), a wide variety of herbicides may potentially be utilized by adjacent landowners. Two commonly used herbicides that are used to control woody vegetation are Roundup® and Brush-B-Gon®. In soil, the half-life of glyphosate, the active ingredient in Roundup®, is 2 to 174 days. Glyphosate is degraded to amino methyl phosphonic acid (AMPA) by organisms in the soil and it, as well as AMPA, adsorbs to soil strongly (NPIC Technical Fact Sheet, 2000). Depending on soil type, the active ingredient in Brush-B-Gon®, Tyiclopyr, exhibits a half-life ranging from 1.1 to 90 days (NPIC Technical Fact Sheet, 2002). A study conducted in Minnesota by USACE revealed a mean half-life of 5.4 days for Triclopyr, while its main metabolite, 3, 5, 6-trichloropyridinol (TCP), had a mean half-life of 11.0 days (Petty et al., 1998).

The habitat management prescriptions under consideration at Grapevine and Lewisville Lake recommend that any herbicide use be pre-approved by USACE, applied on relatively small areas, and only by licensed herbicide applicators to assure that significant impacts to soils do not occur.

For those times and areas that soils are subjected to herbicidal treatments, minor adverse impacts would involve chemical residues that would last between approximately 1 to 200 days after application of herbicides, depending on the herbicide. Additionally the entire area may be subjected to mowing that may induce increased sheet and rill erosion. The degree of impact of each alternative would be proportional to the width of the mowing/underbrushing zone: from 0 acres for the no mowing/underbrushing alternative, to 3,369 acres for the expanded mow alternative, to 26,195 acres if the entire study area were opened to mowing and underbrushing.

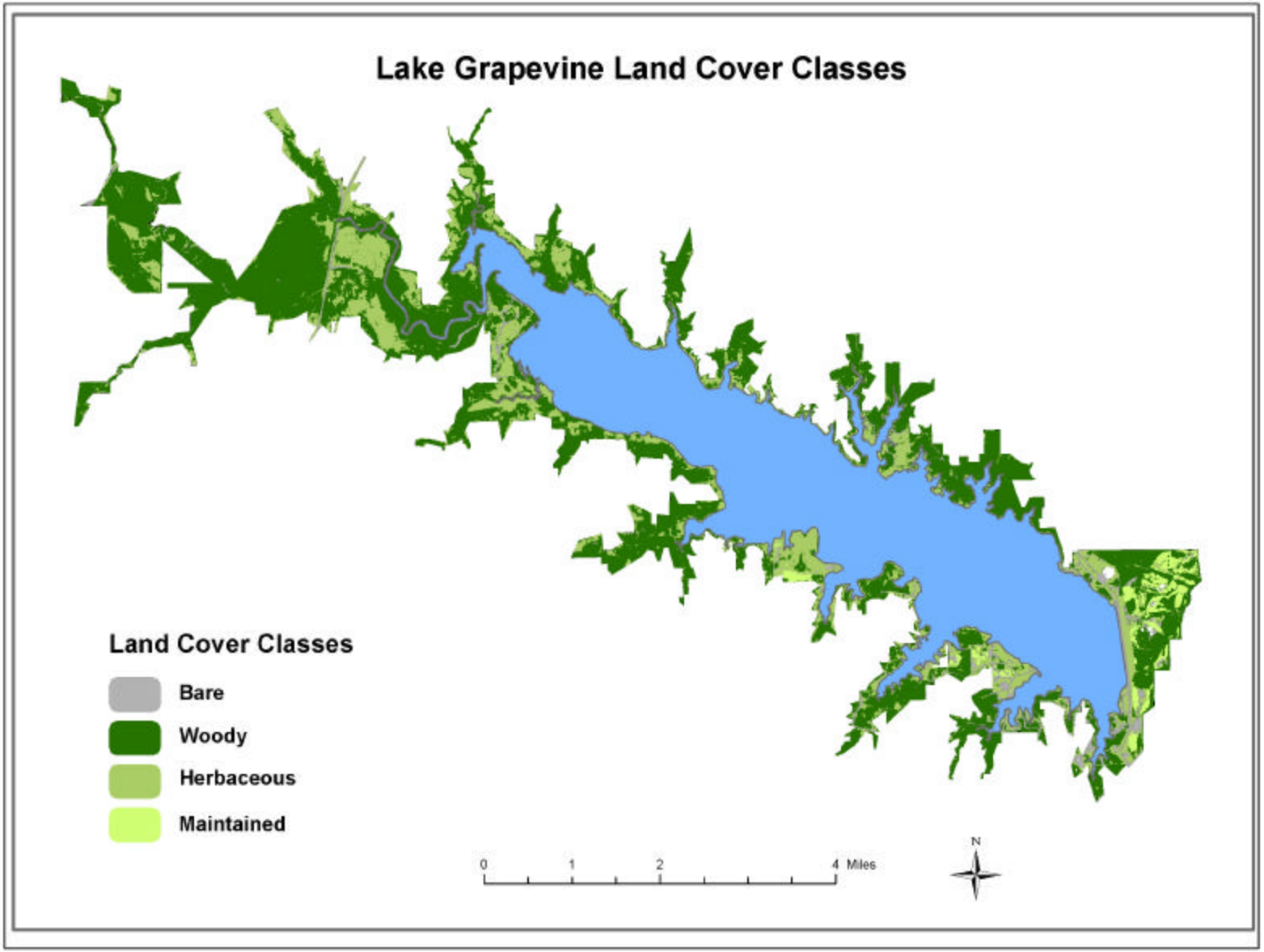


Figure 4-1. Land Cover Classes at Grapevine Lake

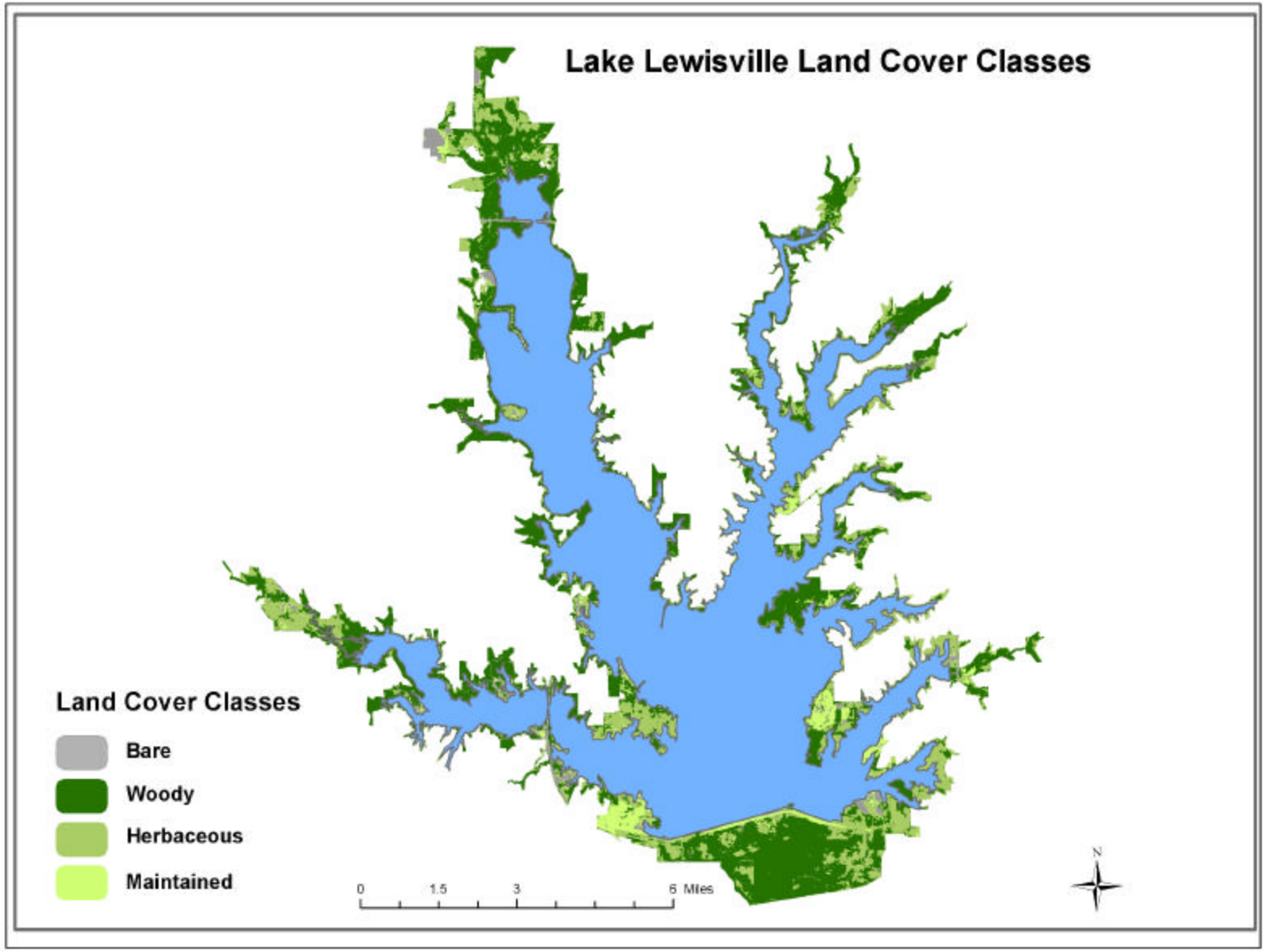


Figure 4-2. Land Cover Classes at Lewisville Lake

Table 4-2. Land cover acreage in mowing/underbrushing and habitat zones for each alternative.

Effect on land cover	Mowing/underbrushing Zone (acres)						Habitat Zone (acres)						OVERALL TOTAL	PERCENT MOW
	Wooded	Herbs	Maint. grasses	Barren	Other	TOTAL	Wooded	Herbs	Maint. grasses	Barren	Other	TOTAL		
Alternative 1 No action	994	511	108	45	124	1,782	14,521	7,374	1,447	968	102	24,413	26,195	6.8%
Alternative 2 No mow	0	0	0	0	0	0	15,514	7,886	1,556	1,013	226	26,195	26,195	0.0%
Alternative 3 Fire safety	597	290	56	29	90	1,063	14,917	7,596	1,500	984	136	25,133	26,195	4.1%
Alternative 4 Minimum buffer	977	501	100	41	123	1,742	14,537	7,385	1,456	972	103	24,453	26,195	6.7%
Alternative 5 Expanded mow	1,954	984	197	88	146	3,369	13,561	6,901	1,359	926	79	22,826	26,195	12.9%
Alternative 6 Mow all	15,514	7,886	1,556	1,013	226	26,195	0	0	0	0	0	0	26,195	100.0%
Alternative 7 Narrow shoreline variance	1,057	559	137	50	124	1,926	14,458	7,326	1,418	963	102	24,269	26,195	7.4%

2. Activities in the Habitat Zone

If undesirable species are subjected to herbicidal control in the habitat zone, similar impacts to soils as those described for the mowing/underbrushing zone may occur (i.e. chemical residue would remain in the soils for periods of 1 to 200 days). The degree of impact of each alternative would be proportional to the width of the habitat zone.

Many studies indicate the efficacy of vegetated buffer zones to trap sediment and decrease erosion near aquatic resources, such as rivers, streams, and lakes (Tattari et al., 2003). Buffer zones ranging from 10 to 200 feet have been recommended to effectively trap sediment and maintain shore stabilization (see, for example, Nieswand, 1990 and Wisconsin Department of Natural Resources).

Research conducted on buffer zones reveals a variety of total suspended solids (TSS) removal at different buffer widths. Forested riparian buffer strips exhibited the greatest TSS removal, with 90% of suspended solids removed at buffer widths of 62 feet and 94% removal at 197 feet (Peterjohn and Correll, 1984). Grassed buffer strips removed less TSS, though still with considerable amounts: Reductions of 79 % in buffer widths from 66 to 98 feet (Young et al., 1980); and TSS removal in buffer widths of 30 feet at 84% (Dillaha, 1989) and 85% (Ghaffarzadeh et al., 1986). Table 2-1 compares different buffer widths and their TSS removal success.

Table 4-3 shows a comparison of how each alternative modification of adjacent landowner guidelines affects soils as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-3. Each alternative's relative effect on soils as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on soils	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects on soils from less mowing and large decrease in potential sheet-and-rill erosion and herbicide use in mow zone	7% increase (small) in potential beneficial effects on soils from less mowing with large increase in protection from shoreline erosion and nonpoint pollution in habitat zone	B
Alternative 3 Fire safety	40% decrease (moderate) in potential adverse effects on soils from less mowing and moderate decrease in potential sheet-and-rill erosion and herbicide use in mow zone	3% increase (small) in potential beneficial effects on soils from less mowing with small increase in protection from shoreline erosion and nonpoint pollution in habitat zone	b
Alternative 4 Minimum buffer	2% decrease (small) in potential adverse effects on soils from less mowing and small decrease in potential sheet-and-rill erosion and herbicide use in mow zone	<1% increase (small) in potential beneficial effects on soils from less mowing with moderate increase in shoreline erosion and nonpoint pollution in habitat zone	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects on soils from more mowing and moderate increase in potential sheet-and-rill erosion and herbicide use in mow zone	7% decrease (small) in potential protection from shoreline erosion and nonpoint pollution in habitat zone	A
Alternative 6 Mow all	1,370% increase (large) in potential adverse effects on soils from mowing and large increase in potential sheet-and-rill erosion and herbicide use in mow zone	100% decrease in potential protection from shoreline erosion and nonpoint pollution in habitat zone	A
Alternative 7 Narrow shoreline variance	8% increase (small) in potential adverse effects on soils from mowing and small increase in potential sheet and rill erosion and herbicide use in mow zone	<1% decrease (small) in potential protection from shoreline erosion and nonpoint pollution in habitat zone	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

C. Water Quality

1. Activities in the Mowing/Underbrushing Zone

As stated under the Physiography (soils) section frequent mowing can lead to soil erosion, which increases the turbidity of water. Likewise, if herbicidal control of undesirable species is allowed, runoff of herbicides residing on the soils after rainfall events may reach lakes, rivers or streams. In water, the half-life of glyphosate, the active ingredient in Roundup®, is less than 7 days (MSDS for Roundup®, 2002). As it and its metabolite, AMPA, adsorb strongly to soil, the potential for leaching into groundwater is low (NPIC Technical Fact Sheet, 2000). Triclopyr, the active ingredient in Brush-B-Gon®, degrades in water when exposed to sunlight and can last from 1 to 10 days depending on conditions (NPIC Technical Fact Sheet, 2002). In a study conducted by USACE, Triclopyr exhibited a half-life of 3.7 to 4.7 days while its metabolites, 3, 5, 6-trichloropyridinol and 3, 5 6-trichloro-2-methoxypyridine, had half-lives of 4.2 to 7.9 days (Petty et al., 1998).

Both Grapevine and Lewisville Lakes are designated for Aquatic Life Use, Contact Recreation Use, General Use, Fish Consumption Use, and Public Water Use, and therefore impacts to water quality from adjacent landowner guidelines are an important consideration. The degree of adverse impact on water quality, while still assumed to be minor due to restrictions on how herbicides are used, is proportional to the width of the mowing/underbrushing zone, and inversely proportional to the width of the habitat zone. A narrow mowing/underbrushing zone and a wide habitat zone would result in less water quality impact. A wide mowing/underbrushing zone and no habitat zone would result in more impact.

2. Activities in the Habitat Zone

If undesirable species are subjected to herbicidal control in the habitat zone, similar impacts to water quality as those described for the mowing/underbrushing zone may occur (i.e. runoff of herbicides residing on the soils after rainfall events may reach lakes, rivers or streams). The degree of impact of each alternative would be proportional to the width of the habitat management zone (from 0 acres for the mow all alternative to 26,195 acres for the no mow alternative.

As well as reducing total suspended solids (TSS) in the form of sediment, buffer zones also lessen the amount of nutrients, such as nitrogen and phosphorous, and other chemicals such as herbicides that can reach lakes, rivers and streams. Similar to TSS, forested riparian buffer strips result the greatest nitrogen and phosphorous removal, with decreases in phosphorus by 95% and as much as 100% of nitrogen in a 33-foot wooded strip (Vought et al., 1995). Results from grass buffer strips tended to be lower: a nitrogen removal of 84% and a phosphorous removal of 83% in widths 66 to 98 feet (Young et al.,1980); and reductions of 79% of phosphorous and 73% of nitrogen in grassed buffer strips 30 feet wide (Dillaha, 1989). Table 2-1 compares different buffer widths and their phosphorus and nitrogen removal success.

Although buffer zones act as a nutrient sink for most of the year, during the dormant season these buffer strips release phosphorous and other nutrients into the groundwater. Harvesting of plant biomass may reduce the amount of nutrients released during the dormant season (Osborne and Kovacic, 1993).

The removal of herbicides from runoff in buffer strips has also been researched. Studies with grass buffer strips in 15-foot widths removed 35% of herbicides, while 30 foot widths trapped 60% (Mickelson and Baker, 1993). In a riparian buffer, herbicide runoff was reduced by 95%, on average, in a 125-foot strip (Vellidis et al., 2002).

The impact of the habitat zone, working as a shoreline buffer, on water quality would be proportional to the width of the habitat zone. The wider the zone, the better the zone would be for reducing soil particles, nutrients and herbicides from reaching the lakes, rivers or streams.

Table 4-4 shows a comparison of how each alternative modification of adjacent landowner guidelines affects water quality as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-4. Each alternative's relative effect on water quality as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on water quality	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects on water quality from mowing with large increase in protection of water quality from nonpoint pollution in mow zone	7% increase (small) in potential beneficial effects on water quality from less mowing with large increase in protection of water quality from nonpoint pollution in habitat zone	B
Alternative 3 Fire safety	40% decrease (moderate) in potential adverse effects on water quality from less mowing with moderate increase in protection of water quality from nonpoint pollution in mow zone	3% increase (small) in potential beneficial effects on water quality from less mowing with small increase in protection of water quality from nonpoint pollution	b
Alternative 4 Minimum buffer	2% decrease (small) in potential adverse effects on water quality from less mowing with small increase in protection of water quality from nonpoint pollution in mow zone	<1% increase (small) in potential beneficial effects on water quality from less mowing with moderate increase in protection of water quality from nonpoint pollution	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects on water quality from mowing with moderate decrease in protection of water quality from nonpoint pollution in mow zone	7% increase (small) in potential adverse effects on protection of water quality from nonpoint pollution	A
Alternative 6 Mow all	1,370% increase (large) in potential impacts to water quality from mowing with large decrease in protection of water quality from nonpoint pollution in mow zone	100% increase (large) in potential adverse effects on protection of water quality from nonpoint pollution	A
Alternative 7 Narrow shoreline variance	8% increase (small) in potential impacts to water quality from mowing with small decrease in protection of water quality from nonpoint pollution in mow zone	<1% increase (small) in potential adverse effects on protection of water quality from nonpoint pollution	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

D. Wetlands

1. Activities in the Mowing/Underbrushing Zone

The potential for encountering fringe wetlands in the mowing/underbrushing zone at the Grapevine and Lewisville Lake shoreline is small. While the ecosystem based vegetation management prescriptions indicate that mowing and underbrushing in all wetland areas should be avoided, there is the potential that inadvertent adverse impacts might occur. There is an increased likelihood of encountering riverine wetlands as one travels up the tributaries draining into the main lake bodies, and those tributaries approach the Federal property line. Impacts to wetlands encountered in this zone would be proportional to the width of the mowing/underbrushing zone since mowing and underbrushing or applying herbicides to control undesirable species on or near these wetlands would adversely impact all wetland functions.

2. Activities in the Habitat Zone

The potential for encountering fringe wetlands in the habitat zone, including the shoreline, at Grapevine and Lewisville Lakes is also small. There is an increased likelihood of encountering riverine wetlands as one moves up the tributaries draining into the main lake bodies, and those tributaries approach the Federal property line. Impacts to wetlands encountered in the habitat management zone would be proportional to the width of this zone if herbicides are applied to control undesirable species.

Table 4-5 shows a comparison of how each alternative modification of adjacent landowner guidelines affects wetlands as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small, moderate and large. The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-5. Each alternative's relative effect on wetlands as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on wetlands	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential to encounter wetlands in mow zone	7% increase (small) in potential to encounter wetlands in habitat zone	b
Alternative 3 Fire safety	40% decrease (moderate) in potential to encounter wetlands in mow zone	3% increase (small) in potential to encounter wetlands in habitat zone	b
Alternative 4 Minimum buffer	2% decrease (small) in potential to encounter wetlands in mow zone	<1% increase (small) in potential to encounter wetlands in habitat zone	b
Alternative 5 Expanded mow	89% increase (moderate) in potential to encounter wetlands in mow zone	7% decrease (small) in potential to encounter wetlands in habitat zone	a
Alternative 6 Mow all	1,370% increase (large) in potential to encounter wetlands in mow zone	There is no habitat zone under this alternative.	a
Alternative 7 Narrow shoreline variance	8% increase (small) in potential to encounter wetlands in mow zone	<1% decrease (small) in potential to encounter wetlands in habitat zone	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

E. Biological Resources

1. Flora

a. Activities in the Mowing/Underbrushing Zone

Studies on mowing have indicated a multitude of effects on flora. For example, some experiments show mowing may allow the incursion of exotic species that out compete the native flora (Gibson et al., 1993). Other studies suggest diversity is maintained by mowing (Collins et al., 1998) or increases (Beltman et al., 2003). Effects on biomass are less conclusive as some studies support increases during the growing season (Penfound, 1964), while other studies show decreases (Beltman, 2003). Research regarding the removal of understory vegetation indicates no negative impacts on overstory species and an increase in diversity of herbaceous species (Horsley, 1994).

If undesirable species in the mowing/underbrushing zone are controlled with herbicides, adjacent landowners might hire licensed herbicide applicators who select herbicides such as Roundup® or Brush-B-Gon®. Roundup® is applied to the foliage of the plant, but is translocated throughout the vascular tissue, including the roots, eventually killing the plant. It will affect all plants contacted by the spray, including grasses (Monsanto, 2002). Brush-B-Gon® controls many annual and perennial broadleaf weeds, including poison ivy (NPIC Technical Fact Sheet, 2002). Since it also affects most broadleaf plants, care must be taken to protect these species.

Applying herbicides in the mowing/underbrushing zone may also adversely affect native and desirable species. Because the vegetation management prescriptions indicate that herbicides should only be applied to relatively small areas by licensed herbicide applicators, adverse impacts are expected to be minor. None-the-less, the degree of impact on flora in the mowing/underbrushing zone is proportional to the width of the mowing/underbrushing zone of each alternative. A narrow mowing/underbrushing zone would result in less impact to flora. A wide mowing/underbrushing zone would result in more impact.

b. Activities in the Habitat Zone

If undesirable species are subjected to herbicidal control in the habitat zone, similar impacts to flora as those described for the mowing/underbrushing zone may occur (i.e. removal of undesirable species), but the strategy would be to remove undesirable species so that native species could occupy the newly opened niche. Thus, it is considered a beneficial impact to native flora. To maintain aquatic habitat along streams, investigation of research indicates buffers should be 35 to 100 ft wide (Wenger, 1999). Buffer zones can increase plant diversity (Tattari et al., 2003), though woody buffer strips have the greatest native plant species richness (Paine and Ribic, 2002). Compared to disturbed areas, grassed buffer strips provided the best erosion control, but the lowest plant species diversity due to the domination of nondesirable species (Paine and Ribic, 2002). Another study concluded that buffers from 10 meters to 30 meters were necessary to conserve biological richness (Spackman and Hughes, 1994). Table 2-2 compares different buffer widths necessary to maintain species diversity.

Table 4-6 shows a comparison of how each alternative modification of adjacent landowner guidelines affects flora as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-6. Each alternative's relative effect on flora as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on flora	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects of mowing and herbicide use on flora in mow zone	7% increase (small) in potential adverse effects of herbicide use on flora in habitat zone	B
Alternative 3 Fire safety	40% decrease (moderate) in adverse potential effects of mowing and herbicide use on flora in mow zone	3% increase (small) in potential adverse effects of herbicide use on flora in habitat zone	b
Alternative 4 Minimum buffer	2% increase (small) in potential beneficial effects of mowing and herbicide use on flora in mow zone	<1% decrease (small) in potential adverse effects of herbicide use on flora in habitat zone	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects of mowing and herbicide use on flora in mow zone	7% decrease (small) in potential adverse effects of herbicide use on flora in habitat zone	A
Alternative 6 Mow all	1,370% increase (large) in potential adverse effects of mowing and herbicide use on flora in mow zone	There is no habitat zone under this alternative.	A
Alternative 7 Narrow shoreline variance	8% increase (small) in potential adverse effects of mowing and herbicide use on flora in mow zone	<1% decrease (small) in potential adverse effects of herbicide use on flora in habitat zone	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

2. Fauna

a. Activities in the Mowing/Underbrushing Zone

Faunal species are affected by mowing based on their habitat use. For example, a study of five passerine birds indicated a general avoidance of mowed vegetation, although dickcissels (*Spiza americana*) tend to prefer mowed grasses in the warm seasons (Walk and Warner, 1999). Small mammals, such as the vole (*Microtus agrestis*), can benefit from annual mowing as a habitat favorable to tunneling is created (Tattersall et al., 2000). Birds nesting on the ground or in shrubs are negatively affected by understory removal, while canopy species may benefit (Rodewald and Smith, 1998).

If undesirable species in the mowing/underbrushing zone are controlled with herbicides, adjacent landowners might hire licensed herbicide applicators who select herbicides such as Roundup® or Brush-B-Gon®. Roundup® is moderately toxic to fish and slightly toxic to aquatic invertebrates, on an acute basis (Monsanto, 2002) and is practically non-toxic to birds (NPIC Technical Fact Sheet, 2000). Triclopyr, the active ingredient in Brush-B-Gon®, is practically non-toxic to fish, while its major metabolite, TCP, is moderately toxic to fish (NPIC Technical Fact Sheet, 2002). Triclopyr is also practically non-toxic to aquatic invertebrates (NPIC Technical Fact Sheet, 2002). Because the vegetation management prescriptions indicate that herbicides

should only be applied to relatively small areas by licensed herbicide applicators, adverse impacts are expected to be minor.

The impact of mowing and underbrushing adversely affects some floral species and beneficially affects other floral species, which may have a subsequent influence on the fauna that utilize an area. These impacts would be proportional to the width of the mowing/underbrushing zone of each alternative. A narrow mowing/underbrushing zone would result in less impact to fauna. A wide mowing/underbrushing zone would result in more impact.

b. Activities in the Habitat Zone

If undesirable species are subjected to herbicidal control in the habitat zone, similar minor adverse impacts to fauna as those described for the mowing/underbrushing zone may occur (e.g., very small impact from herbicides to fauna in the habitat zone). When invasive floral species are removed from the habitat management zone, and native species encouraged, the newly opened niches represent a beneficial impact to native fauna. These impacts would be proportional to the width of the habitat zone of each alternative. A narrow habitat zone would result in less beneficial impact to fauna. A wide habitat zone would result in more beneficial impact.

Recommended widths of buffer strips for ecological concerns are typically much wider than those recommended for water quality concerns. To protect wildlife habitats near riparian areas, buffers of 30 meters (98 feet) to 100 meters (328 feet) are suggested in reviews (Castelle et al., 1994; Wenger, 1999; Bernthal, 1999; Fischer et al., 2000). Three to five times as many animals utilize buffer sites compared to pasture sites (Chapman and Ribic, 2002). Buffer zones serve as useful habitat for several salamander species and widths over 40 meters (131.2 feet) had approximately the same abundance and diversity, while managed forests had 50% less species richness and 33% less abundance (Vesely and McComb, 2002). Some studies indicate that buffer zones increase bird diversity (Tattari et al., 2003), while others found no difference in species abundance or richness compared to controls, though edge species, such as the blue jay (*Cyanocitta cristata*), were more common in buffer strips (Mieklejohn and Hughes, 1999). Research concerning the maintenance of bird species richness recommends buffer strips ranging from 230 feet to 574 feet (Johnson and Brown, 1990; Spackman and Hughes, 1993).

Table 4-7 shows a comparison of how each alternative modification of adjacent landowner guidelines affects flora as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-7. Each alternative's relative effect on fauna as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on fauna	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects of mowing and herbicide use on fauna in mow zone	7% increase (small) in potential adverse effects of herbicide use on fauna in habitat zone	B
Alternative 3 Fire safety	40% decrease (moderate) in adverse potential effects of mowing and herbicide use on fauna in mow zone	3% increase (small) in potential adverse effects of herbicide use on fauna in habitat zone	b
Alternative 4 Minimum buffer	2% increase (small) in potential beneficial effects of mowing and herbicide use on fauna in mow zone	<1% decrease (small) in potential adverse effects of herbicide use on fauna in habitat zone	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects of mowing and herbicide use on fauna in mow zone	7% decrease (small) in potential adverse effects of herbicide use on fauna in habitat zone	A
Alternative 6 Mow all	1,370% increase (large) in potential adverse effects of mowing and herbicide use on fauna in mow zone	There is no habitat zone under this alternative.	A
Alternative 7 Narrow shoreline variance	8% increase (small) in potential adverse effects of mowing and herbicide use on fauna in mow zone	<1% decrease (small) in potential adverse effects of herbicide use on fauna in habitat zone	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

3. Wildlife Habitat

a. Future without ecosystem management prescriptions.

Modifications of adjacent landowner guidelines could involve changing the width of the mowing/underbrushing zone and/or the shoreline buffer zone, but not include ecosystem management prescriptions (see Appendix H). If this happens, a reasonable assumption is that current levels of habitat quality measured in the existing mowing/underbrushing zone will exist in the future under any given mowing/underbrushing zone width. Likewise, a reasonable assumption is that current levels of habitat quality measured in the existing non-mowing/underbrushing zone will exist in the future under any given mowing/underbrushing zone width. This assumption implies that if the width of the current mowing/underbrushing zone is reduced, the overall quality of the study area will go up because succession would increase the habitat quality in those areas that would no longer be mowed. Likewise, if the width of the current mowing/underbrushing zone is increased, the overall quality of the study area will go down.

Under status quo conditions (i.e. the current adjacent landowner guidelines at Grapevine and Lewisville, a 25 foot and 50 foot wide mowing/underbrushing zone respectively) there are currently approximately 1,782 acres in the mowing/underbrushing zone providing approximately 640 Habitat Units of the total 14,621 Habitat Units

in the study area. For each alternative, habitat quality scores in the mowing/underbrushing zone were assumed to mimic the average scores currently observed under existing conditions in the mowing/ underbrushing zone (0.46 in wooded areas and 0.30 in herbaceous/grassland areas). Likewise, habitat quality scores in the habitat zone were assumed to mimic the average scores currently observed under existing conditions the habitat zone (0.70 in wooded areas and 0.43 in herbaceous/grassland areas). (See Table 3-11 for existing condition habitat quality scores.) Table 4-8 indicates the number of Habitat Units for each alternative. The degree of impact on wildlife habitat in the mowing/underbrushing zone is proportional to the width of the mowing/underbrushing zone and the habitat zone of each alternative. If mowing/underbrushing zone were to be expanded to include the entire study area (i.e. Alternative 6), a total of approximately 9,924 Habitat Units would still occur, but 4,698 Habitat Units would be lost over existing conditions. If the mowing/underbrushing zone were eliminated (i.e., Alternative 2), a total of approximately 14,945 Habitat Units would occur, an increase of 324 Habitat Units over existing conditions, even without ecosystem based vegetation management efforts. The other alternatives result in a range of 133 additional Habitat Units to a loss of 307 Habitat Units.

Table 4-8 shows a comparison of how each alternative modification of adjacent landowner guidelines affects habitat units as compared to the existing adjacent landowner guidelines. Assuming that no vegetation management prescriptions are implemented. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-8. Effects of Alternatives on Habitat Units at Grapevine and Lewisville Lakes if no ecosystem based vegetation management prescriptions are implemented.

Effect on habitat units without prescriptions	Mow/underbrush Zone		Habitat Zone		Total Habitat Units	Percent Change over Status-Quo	Effect Relative to Status-Quo[1]
	Wooded	Herbaceous & Grasslands	Wooded	Herbaceous & Grasslands			
Alternative 1 No action	457	183	10,189	3,793	14,622	Status-Quo	Status -Quo
Alternative 2 No mow	0	0	10,886	4,060	14,945	+2.2 %	b
Alternative 3 Fire safety	275	102	10,467	3,911	14,754	+0.9 %	b
Alternative 4 Minimum buffer	450	177	10,200	3,801	14,628	0.0 %	nc
Alternative 5 Expanded mow	899	349	9,515	3,552	14,315	-2.1%	a
Alternative 6 Mow all	7,137	2,788	0	0	9,924	-32.1%	A
Alternative 7 Narrow shoreline variance	486	205	10,144	3,760	14,596	-0.2 %	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

b. Future with ecosystem management prescriptions

Adjacent landowner guidelines could involve changing the width of the mowing/underbrushing zone and/or the habitat zone, and include ecosystem management prescriptions (see Appendix H) that could be implemented by community groups, lead by a master naturalist, with permit issued by USACE. If this happens, a reasonable assumption is that current levels of habitat quality measured in the existing mowing/underbrushing zone will continue to exist in a future mowing/underbrushing zone. However, with ecosystem based vegetation prescriptions applied to the habitat zones, a reasonable assumption is that future habitat quality can be improved by overcoming the limiting factors that currently are keeping Grapevine and Lewisville Lakes habitat quality at its moderate levels.

A careful examination of the WHAP results indicates the limiting factors, those that are keeping the Habitat Quality scores at low average levels at Grapevine and Lewisville Lakes, are due to the fact that most of the study area would not support wetland, bog, marsh, or bottomland hardwood habitat (the "site potential" factor; it is the most important factor in WHAP, worth 25 of the possible 100 points in WHAP). Existing conditions at Grapevine and Lewisville Lakes for this factor average 12.03 points in forested areas, and average 11.48 points in grasslands (both mowed and unmowed grasslands). Under active ecosystem management prescriptions, this factor might be raised to an average of 15 points in both forested and grassland areas.

The second most limiting factor ("uniqueness and relative abundance" factor; worth 20 of the total WHAP points) is that most of the study area is currently not, nor could it be managed to become what is considered "highly valuable for wildlife and very uncommon, unique or irreplaceable". Existing conditions at Grapevine and Lewisville Lakes for this factor average 6.88 points in forested areas, and 4.85 in grassland areas. However, this factor could reasonably be raised to an average of 15 points, if the habitat in the study area could be managed to a level considered "high to medium value for wildlife, and is relatively abundant".

The other variables have less importance in WHAP (i.e. between 5 and 8 points available), and the area's average for those variables is closer to the maximum available points. None-the-less, under active ecosystem management prescriptions, it appears reasonable that overall WHAP scores in forested areas in the habitat management and shoreline management zones could be raised from an existing average of 56.44 points to a future average of 78 points, and in grassland areas in the habitat management and shoreline management zones the scores raised from an existing average of 33.42 points to a future average of 74 points.

Using these assumptions, habitat quality scores in the mowing/underbrushing zone were assumed to mimic the average scores currently observed under existing conditions in the mowing/ underbrushing zone (0.46 in wooded areas and 0.30 in herbaceous/grassland areas). When ecosystem based vegetation management prescriptions are fully implemented and become fully functional (estimated to be 50 years), habitat quality scores in the habitat zone were assumed to increase to 0.78 in wooded areas and 0.74 in herbaceous/ grassland areas.

Under status quo conditions (i.e. the current adjacent landowner guidelines at Grapevine and Lewisville, a 25 foot and 50 foot wide mowing/underbrushing zone respectively) there are currently approximately 1,782 acres in the mowing/underbrushing zone providing approximately 640 Habitat Units of the total 14,621 Habitat Units in the study area. For each alternative, habitat quality scores in the mowing/underbrushing zone were assumed to mimic the average scores currently observed under existing conditions in the mowing/ underbrushing zone. However, habitat quality scores in the habitat zone were assumed to increase as described above. Table 4-9 indicates the number of Habitat Units for each alternative, assuming ecosystem based vegetation prescriptions is applied to the entire habitat zone, but it is important to emphasize that these prescriptions would only be applied to a much smaller area. The degree of impact on wildlife habitat in the mowing/underbrushing zone is proportional to the width of the mowing/underbrushing zone and the habitat zone of each alternative. If mowing/underbrushing zone were to be expanded to include the entire study area (i.e. Alternative 6), a total of approximately 9,924 Habitat Units would still occur, but 4,698 Habitat Units would be lost over existing conditions. If the mowing/underbrushing zone were eliminated (i.e., Alternative 2), and the ecosystem based vegetation management prescriptions were applied to the entire habitat zone, a total of approximately 19,088 Habitat Units would occur, an increase of 4,446 Habitat Units over existing conditions. The other alternatives, again assuming ecosystem based prescriptions were applied to the entire habitat zone, would result in a range of 3,316 to 4,121 additional Habitat Units over existing conditions. In all

likelihood, however, the ecosystem management prescriptions would only be applied to a small percentage of the total habitat zone since community groups are unlikely to have the resources, both time and money, to fully implement the prescriptions.

Table 4-9 indicates the impact of each alternative on total Habitat Units when ecosystem based vegetation management prescriptions are implemented and become fully functional as described above. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative (still assuming no ecosystem based vegetation management prescriptions in the habitat zone under status-quo) and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-9. Effects of Alternatives on Habitat Units at Grapevine and Lewisville Lakes if ecosystem based vegetation management prescriptions are fully implemented.

Effect on habitat units with prescriptions	Mow/underbrush Zone		Habitat Zone		Total Habitat Units	Percent Change over Status-Quo	Effect Relative to Status-Quo[1,2]
	Wooded	Herbaceous & Grasslands	Wooded	Herbaceous & Grasslands			
Alternative 1 No action	457	183	10,189	3,793	14,622	Status-Quo	Status-Quo
Alternative 2 No mow	0	0	12,101	6,987	19,088	+30.5 %	B
Alternative 3 Fire safety	275	102	11,635	6,730	18,743	+28.2 %	B
Alternative 4 Minimum buffer	450	177	11,339	6,542	18,508	+26.6 %	B
Alternative 5 Expanded mow	899	349	10,578	6,112	17,938	+22.7 %	B
Alternative 6 Mow all	7,137	2,788	0	0	9,924	-32.1 %	A
Alternative 7 Narrow shoreline variance	486	205	11,277	6,471	18,440	+26.1 %	B

[1] a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change
[2] Significant beneficial impacts to wildlife, as compared to status-quo, are expected if ecosystem based vegetation management prescriptions are fully implemented, but significant beneficial impacts to wildlife are not expected if ecosystem based vegetation management prescriptions are not fully implemented. USACE believes that community groups will have the resources to achieve beneficial effects on wildlife habitat quality on only a small percentage of the more than 20,000 acres in the habitat zone, and will therefore not cross the significance threshold.

4. Threatened and Endangered Species

Currently, no threatened or endangered species are known to occur in the Lewisville or Grapevine Lake areas, and therefore no impact would be expected from any alternative.

F. Air Quality

1. Activities in the Mowing/Underbrushing Zone

The only impacts to air quality would be due to emissions from frequent mowing during summer months with hand operated lawn mowers in the mowing/underbrushing zone. These impacts would occur during summer months when ozone exceedances are more common. Air quality impacts from activities in the mowing/underbrushing zone would be proportional to the width of the mowing/underbrushing zone of each alternative. U.S. Environmental Protections Agency (2004) estimates that nonroad, nonhandheld, gas, spark ignition engines up to 6 horsepower (most lawnmowers fall in this category) emit between 13 and 40 grams of hydrocarbon and 1.8 and 2.0 grams of nitrogen oxides per horsepower per hour (depending on whether the engine is side-valved or overhead-valved, respectively). These two pollutants are highlighted because they contribute to ozone formation, and Grapevine and Lewisville Lakes are in non-compliance regions for ozone. Assuming a mowing rate of 0.5 acres per hour with 5 horsepower mowers, the entire mowing/underbrushing zone would require 3,564 hours to mow under status quo conditions (1,782 acres), and emit between approximately 232,000 and 713,000 grams (500 to 1,600 pounds) of hydrocarbons per mowing. Nitrogen oxides would be emitted at a rate of between approximately 32,000 and 36,000 grams (70 and 80 pounds) of nitrogen oxides per mowing. To put this in perspective, the Federal Transit Authority (2004) estimates that light duty vehicles (1995 model year) average approximately 2.3 grams of hydrocarbons and 0.77 grams of nitrogen oxides per mile driven at average speeds (35 mph). It would take approximately 100,000 to 300,000 cars traveling 1 mile at 35 mph to generate the same amount of hydrocarbons as one complete mowing. This happens many times over each day in the Dallas/Fort Worth metropolitan area. A narrow mowing/ underbrushing zone would result in less impact to air quality. A wide mowing/underbrushing zone would result in more impact.

2. Activities in the Habitat Zone

The only impacts to air quality would be due to emissions from rare (once every year or two) mowing with hand operated lawn mowers in the habitat zone. These impacts would occur during fall months after native grasses have stored the maximum amount of nutrients possible in their roots. Impacts to air quality from rare mowing in the habitat management zone are likely to be negligible since ozone exceedances rarely occur at this time of year.

Table 4-10 shows a comparison of how each alternative modification of adjacent landowner guidelines affects air quality as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-10. Each alternative's relative effect on air quality as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on air quality	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects of less mowing on air quality in mow zone	Little effect on air quality due to little mowing in habitat zone, which would not occur during ozone season.	B
Alternative 3 Fire safety	40% decrease (moderate) in potential adverse effects of less mowing on air quality in mow zone	Little effect on air quality due to little mowing in habitat zone, which would not occur during ozone season.	B
Alternative 4 Minimum buffer	2% increase (small) in potential beneficial effects of less mowing on air quality in mow zone	Little effect on air quality due to little mowing in habitat zone, which would not occur during ozone season.	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects of more mowing on air quality in mow zone	Little effect on air quality due to little mowing in habitat zone, which would not occur during ozone season.	A
Alternative 6 Mow all	1,370% increase (large) in potential adverse effects of more mowing on air quality in mow zone	There is no habitat zone under this alternative.	A
Alternative 7 Narrow shoreline variance	8% increase (small) in potential adverse effects of more mowing on air quality in mow zone	Little effect on air quality due to little mowing in habitat zone, which would not occur during ozone season.	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

G. Noise

1. Activities in the Mowing/Underbrushing Zone

The only impacts to noise levels would be due to frequent mowing during summer months with pushed lawn mowers (average approximately 85 dB) in the mowing/underbrushing zone. EPA Noise Criteria (1974) for outdoor noise levels identified limits of 70 dB (24 hours per day) for hearing loss consideration and 55 dB for activity interference. It is unlikely that mowing would occur for more than a few hours per mowing, and therefore it is not anticipated that noise levels will exceed the EPA criteria. The noise impacts that would occur from activities in the mowing/underbrushing zone would, none-the-less be proportional to the width of the mowing/underbrushing zone of each alternative due to the range of mowing duration. A narrow mowing/underbrushing zone would result in less impact to noise level, while a wide zone would result in more impact.

2. Activities in the Habitat Zone

The only impacts to noise levels would be due to rare (once every year or two) mowing with hand operated lawn mowers in the habitat management zone. These impacts would occur during fall months after native grasses have stored the maximum amount of nutrients possible in their roots. Impacts to noise levels from rare mowing in the habitat management zone are likely to be negligible.

Table 4-11 shows a comparison of how each alternative modification of adjacent landowner guidelines affects air quality as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small, moderate, and large. The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-11. Each alternative's relative effect on noise as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on noise	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential adverse effects of less mowing on noise in mow zone	Little effect on noise due to little mowing in habitat zone.	b
Alternative 3 Fire safety	40% decrease (moderate) in potential adverse effects of less mowing on noise in mow zone	Little effect on noise due to little mowing in habitat zone.	b
Alternative 4 Minimum buffer	2% increase (small) in potential beneficial effects of less mowing on noise in mow zone	Little effect on noise due to little mowing in habitat zone.	b
Alternative 5 Expanded mow	89% increase (moderate) in potential adverse effects of more mowing on noise in mow zone	Little effect on noise due to little mowing in habitat zone.	a
Alternative 6 Mow all	1,370% increase (large) in potential adverse effects of more mowing on noise in mow zone	There is no habitat zone under this alternative.	a
Alternative 7 Narrow shoreline variance	8% increase (small) in potential adverse effects of more mowing on noise in mow zone	Little effect on noise due to little mowing in habitat zone.	a

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

H. Recreation and Open Space

Since this assessment only addresses the mowing, underbrushing and access path guidelines of the Shoreline Management Plan that pertains to adjacent landowners, there will be no impacts involving the designated recreation areas maintained by USACE at Grapevine and Lewisville Lakes (approximately 9,061 of the 26,195 acres between the property line and the conservation pool elevation). None-the-less, some

adjacent landowners have indicated that they wish to maintain Federal lands between their property and the shoreline in a manner that encourages intense recreational use (e.g. parkland type use) of lands currently designated by the USACE as low density recreational lands.

Table 4-12 shows a comparison of how each alternative modification of adjacent landowner guidelines affects recreational use of lands designated as low density recreational lands at Grapevine and Lewisville Lakes as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-12. Each alternative's relative effect on potential intense recreational use of lands designated as low density recreational lands as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect of intense recreational use of lands designated as low density recreational lands	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	no change in potential intense recreational use of lands designated as low density recreational or wildlife lands in habitat zone	A
Alternative 3 Fire safety	40% decrease (moderate) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	3% decrease (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in habitat zone	a
Alternative 4 Minimum buffer	2% decrease (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	<1% decrease (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in habitat zone	a
Alternative 5 Expanded mow	89% increase (moderate) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	7% increase (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in habitat zone	B
Alternative 6 Mow all	1,370% increase (large) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	100% increase (large) in potential intense recreational use of lands designated as low density recreational or wildlife lands	B
Alternative 7 Narrow shoreline variance	18% increase (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in mow zone	<1% increase (small) in potential intense recreational use of lands designated as low density recreational or wildlife lands in habitat zone	b

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

An underlying need that USACE is responding to in its consideration of modifying allowable adjacent landowner activities on Federal land is to manage and conserve natural resources while providing quality public outdoor recreation experiences (both intense recreation, and low density recreation) for present and future generations. USACE attempts to balance needs and desires of adjacent landowners while managing and conserving natural resources on public lands for all, not just for those who own property adjacent to those public lands. People in north Texas, an area that has experienced rapid urbanization for the past half-century and considering that Federal lands account for only approximately 1.5% of Texas, see public land as an exceptionally valuable resource. Any activities that adjacent landowners are permitted to do that alter public lands, especially lands designated for low density recreational use or for wildlife purposes (15,344 acres at the two lakes) are often viewed by the general public and other resource agencies (e.g. the Fish and Wildlife Service) as counter to the expectations of USACE's environmental stewardship of public lands.

Table 4-13 shows a comparison of how each alternative modification of adjacent landowner guidelines affects USACE's environmental stewardship of lands not designated as recreational lands as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-13. Each alternative's relative effect on USACE's environmental stewardship of lands designated as low density recreational or wildlife lands as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on USACE's environmental stewardship	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% increase (large) in managing public lands for environmental stewardship in mow zone	7% increase (small) in managing public lands for environmental stewardship in habitat zone	B
Alternative 3 Fire safety	40% increase (moderate) in managing public lands for environmental stewardship in mow zone	3% increase (small) in managing public lands for environmental stewardship in habitat zone	B
Alternative 4 Minimum buffer	2% increase (small) in potential managing public lands for environmental stewardship in mow zone	<1% increase decrease (small) in managing public lands for environmental stewardship in habitat zone	b
Alternative 5 Expanded mow	89% decrease (moderate) in managing public lands for environmental stewardship in mow zone	7% decrease (small) in managing public lands for environmental stewardship in habitat zone	A
Alternative 6 Mow all	1,370% decrease (large) in managing public lands for environmental stewardship in mow zone	100% decrease (large) in managing public lands for environmental stewardship	A
Alternative 7 Narrow shoreline variance	No change since variance will require habitat mitigation by permittee.	No change since variance will require habitat mitigation by permittee.	nc

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

I. Socioeconomic Conditions

The socioeconomic impacts associated with modifying adjacent landowner guidelines may involve the costs and effort that some adjacent landowners might incur to reduce or remove species they find undesirable (e.g. rodents and snakes) from their private property, or the costs associated with property loss if wildland fires damage or destroy private property. Wildland fire concerns would be important to adjacent landowners who have structures (e.g., homes, storage sheds) within 30 feet of the Federal property line. The National Interagency Fire Center (www.nifc.gov) and the organization Firewise (www.firewise.org) have recommended a 30-foot wide firebreak between wildland areas and structures, where fuel sources (e.g. grasses and shrubs) are trimmed or removed, and tree branches removed up to 12 feet above the surface of the ground to prevent the ladder effect of flames climbing a tree and reaching the canopy. Additionally, the ecosystem based vegetation prescriptions suggest mowing the habitat area once every year or two as a mechanical method of removing wildland fire fuels in a manner to mimic what natural fires would do in uncontrolled conditions.

Table 4-13 shows a comparison of how each alternative modification of adjacent landowner guidelines affects socioeconomic factors as compared to the existing adjacent landowner guidelines. The relative effect can be partially quantified by determining the percent change in sizes of the mowing/underbrushing and habitat zones between the no action or status-quo alternative and every other alternative analyzed. Here, the relative effect was qualified as small (less than 10% change from status quo), moderate (10% to 20% change from status quo) and large (greater than 20% change from status quo). The quantitative and qualitative determination can lead to a small beneficial effect (b), a significant beneficial effect (B), a small adverse effect (a), or a significant adverse effect (A).

Table 4-13. Each alternative's relative effect on socioeconomics as compared to Alternative 1, the No Action or Status-Quo alternative.

Effect on Socioeconomics	Zone 1: mow zone	Zone 2: habitat zone	Effect Relative to Status-Quo[1]
Alternative 1 No action	1,782 acres	24,413 acres	Status-Quo
Alternative 2 No mow	100% decrease (large) in width of (mow) zone that tends to discourage wildlife from approaching property line. 100% decrease (large) in firebreaks.	Mowing once every one or two years can remove most wildland fire fuel.	A
Alternative 3 Fire safety	Little or no effect since both lakes already have at least 25-foot wide mow zones	Mowing once every one or two years can remove most wildland fire fuel.	nc
Alternative 4 Minimum buffer	2% decrease (small) in width of (mow) zone that tends to discourage wildlife from approaching property line. 2% decrease (small) in potential firebreaks in narrow areas.	Mowing once every one or two years can remove most wildland fire fuel.	a
Alternative 5 Expanded mow	Little or no effect since both lakes already have at least 25-foot wide mow zones	Mowing once every one or two years can remove most wildland fire fuel.	nc
Alternative 6 Mow all	Little or no effect since both lakes already have at least 25-foot wide mow zones	There is no habitat zone under this alternative.	B
Alternative 7 Narrow shoreline variance	Little or no effect since both lakes already have at least 25-foot wide mow zones	Mowing once every one or two years can remove most wildland fire fuel.	nc

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

Summary of Impacts of Proposed Action and Alternatives

Table 4-14 summarizes the relative general effects of each mowing/underbrushing alternative when compared to the no-action (or status quo) alternative. Table 4-15 summarizes the relative effects of each access path alternative.

Table 4-14. Relative Effects for Alternatives as Compared to the No Action/Status Quo Alternative.

Effects on Environment		Alternative 1 No action/Status quo	Alternative 2 No mow	Alternative 3 Fire Safety	Alternative 4 Minimum Buffer	Alternative 5 Expanded mow	Alternative 6 Mow all	Alternative 7 Narrow Shoreline Variance
Physiography (Soils)		current level of sheet and rill and shoreline erosion	B	b	b	A	A	a
Water Quality		current level of non-point pollution	B	b	b	A	A	a
Wetlands		current level of encountering fringe or riverine wetlands (current level is very low)	b	b	b	a	a	a
Flora		current level of species richness and diversity; some undesirable and exotic species; possibility of fire due to dry grass/ underbrush	B	b	b	A	A	a
Fauna		current level of species richness and diversity; some undesirable and species	B	b	b	A	A	a
Wildlife	without ecosystem prescriptions	mixture of habitats for tall/short-grass & under/over-story species; some undesirable species in nonmowed areas; 14,622 Habitat Units	b	b	nc	a	A	a
	With ecosystem prescriptions	mixture of habitats for tall/short-grass & under/over-story species; some undesirable species in nonmowed areas; 18,440 Habitat Units	B[2]	B[2]	B[2]	B[2]	A	B[2]
T&E Species		None in lake area						
Air Quality		some emissions from lawn mowers during summer months	B	b	b	A	A	a
Noise		current level of noise from mowing	b	b	b	a	a	a
Recreational use of non-recreational lands		current level of recreational use of lands not designated as recreational lands	A	a	a	b	B	b
Environmental stewardship of non-recreational lands		current level of environmental stewardship of lands not designated as recreational lands	B	b	b	A	A	nc
Socio-Economic		current levels of: cost and effort to control undesirable species on private land; potential property loss from wildland fire; and shoreline access for adjacent land owners	A	nc	a	nc	B	nc
Does alternative cross significance threshold?		No	Yes	No[2]	No[2]	Yes	Yes	No[2]

[1] a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change

[2] Significant beneficial impacts to wildlife, as compared to status-quo, are expected if ecosystem based vegetation management prescriptions are fully implemented, but significant beneficial impacts to wildlife are not expected if ecosystem based vegetation management prescriptions are not fully implemented. USACE believes that community groups will have the resources to achieve beneficial effects on wildlife habitat quality on only a small percentage of the more than 20,000 acres in the habitat zone, and will therefore not cross the significance threshold.

Table 4-15. Relative Effects Associated with Access Paths

Effects on Environment	Impacts of Access Paths		
	Individual Paths	Community Paths	No Paths
Physiography (Soils)	some gully and shoreline erosion	reduction of gully and shoreline erosion	least amount of gully and shoreline erosion
Water Quality	some turbidity due to mowing for paths	less turbidity	least turbidity
Flora	little effect on flora	little effect on flora	little effect on flora
Fauna	some species utilize existing paths as corridors	fewer corridors	fewest corridors
Wildlife	more habitat fragmentation	some habitat fragmentation	least habitat fragmentation
T&E Species	none in lake area		
Air Quality	little effect on air quality	little effect on air quality	little effect on air quality
Noise	some noise from mowing	decrease in noise from lawnmowers	no noise from lawnmowers
Recreational use of non-recreational lands	non-recreational lands are most accessible	non-recreational lands are accessible	non-recreational lands are least accessible
Environmental stewardship of non-recreational lands	non-recreational land is most accessible	non-recreational land is accessible	non-recreational land is least accessible
Socio-Economic	shoreline is most accessible for adjacent landowners	shoreline is accessible to adjacent landowners	shoreline is least accessible to adjacent landowners

Chapter 5: Permits and Regulatory Requirements as Required

None of the activities associated with the preferred alternative are expected to require Clean Water Act, Section 404 wetlands permits, nor Clean Water Act National Discharge Elimination System permits.

Chapter 6: Cumulative Impacts

Cumulative impacts (or synonymously, cumulative effects), as defined by the Council on Environmental Quality regulations (40 CFR 1508.27), refer to the impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. This definition encompasses the following implications relative to this programmatic environmental assessment:

- the action refers to modifying established guidelines for adjacent landowner activities on Federal lands at Grapevine and Lewisville Lakes

- the direct and indirect incremental impacts (effects) of the proposed action itself represent a key criterion in determining if cumulative effects on localized and regional environmental and natural resources, ecosystems, and human communities need to be addressed (e.g., if the action has no effects on a given resource, then it is not necessary to address the existing cumulative effects which have occurred on the resource)

- for those cumulative effects which need to be addressed, it is necessary to consider the direct and indirect effects of past, present, and reasonably foreseeable future actions on the affected resources, ecosystems, and human communities (past actions can include those in the area prior to the adjacent landowner guidelines currently in place; present actions include those involving on-going habitat alterations [e.g. Corps' operations and maintenance activities at park sites, or other long-term permitted activities such as marinas and yacht clubs] and reasonably foreseeable future actions include those beyond mere speculation, but within the time frame for analysis)

- direct effects are those effects caused by the proposed action, past actions, present actions, or reasonably foreseeable future actions, which occur at the same time and place as the respective actions (40 CFR 1508.8a): indirect effects are caused by the respective actions and are later in time or farther removed in distance, but are still reasonably foreseeable (indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems) (40 CFR 1508.8b)

- the respective actions may have been, or will be, the result of decisions made by various governmental levels (Federal, state, or local) or the private sector; further, such actions may be on or nearby Grapevine or Lewisville Lake, or off-site (the key issue is that common resources, ecosystems, or human communities are being affected by both the adjacent landowner guidelines and these other activities)

- cumulative effects need to be analyzed relative to a place-based perspective (the situation at the Grapevine and Lewisville Lakes and in nearby areas) regarding the specific resources, ecosystems, and human communities being affected

- each affected resource, ecosystem, and human community must be analyzed in terms of its sustainability and capacity to accommodate additional effects, based on its own time and space parameters

The 11-step CEA methodology published in 1997 by the Council on Environmental Quality (CEO) was utilized as the framework for this cumulative effects study (Council on Environmental Quality, 1997). The concepts embodied in the 11 steps are also included in a U.S. Environmental Protection Agency report related to the review of cumulative effects information in environmental impact statements (EISs) (U.S. Environmental Protection Agency. 1999).

The initial step focused on establishing the direct and indirect impacts of the existing adjacent landowner guidelines and the anticipated impacts of changing those guidelines discussed in Chapter 4. The focus was on those resources, ecosystems, and human communities that have been or will be impacted under a series of reasonable adjacent landowner activities alternatives.

- the primary direct effect discerned in the environmental assessment involves habitat modification induced by mowing and underbrushing or by implementing ecosystem based vegetation management prescriptions.

- the primary indirect effects discerned in the environmental assessment involves: (1) water quality changes that may occur after habitat alteration (for example, increased erosion if the mowing/underbrushing zone is larger); (2) effect on adjacent landowners access to the lake's shore (e.g. more difficult access if the mowing/underbrushing zone is smaller), costs of removing or discouraging undesirable species (e.g. rodents, snakes) on their private property and risk of damage or loss of property due to wildland fires starting on Federal lands and crossing to private lands.

The geographic scope of this cumulative effects analysis was dependent on the affected resources, ecosystems, and human communities within the vicinity of Grapevine and Lewisville Lakes. Further, it was necessary to utilize different boundaries for some of the impacted items. For the habitat alteration, the geographic scope includes the Federal lands at Grapevine and Lewisville Lakes, as well as the north central Texas regional context of the Blackland Prairies and the Cross Timbers ecosystems. For water quality, the lakes themselves represent the geographic scope. For the human community, adjacent landowners comprise the geographic scope.

The time frame of this cumulative effects analysis included the past, present, and future. The historical (past) boundary (or reference point) utilized for habitat considerations was based on information recorded about the Blackland Prairies and Cross Timbers in the mid 1800's, while historical conditions for water quality considerations and adjacent landowners was based on conditions known just prior to the construction of the two lakes. Historical trends, up to the current time, for the impacted resources, ecosystems, and human communities were also considered. The future time boundary selected, 50 years, was based on the length of time that water supply contracts and renewals are issued.

The baseline condition for examining cumulative effects on the resources, ecosystems, and human communities that could be affected by modifying allowable adjacent landowner activities was considered to be those conditions that existed in the early- to mid-1800's, at about the time large numbers of European American pioneers began altering the landscape for agricultural purposes. Descriptions of those conditions is perhaps best gleaned from Francaviglia's (2000) book *The Cast Iron Forest*, which describe the natural conditions that encouraged the Cross Timbers and Blackland Prairies, the natural history of the area as described by early European Americans, and how the Cross Timbers were transformed by those pioneers.

Francaviglia states that farmers could not settle much of the area without the hard work of an axe, so settlers preferred the adjoining grasslands for farming as long as there was enough wood nearby for constructing homes. Jordan (1975) noted "[*T*]*he early Anglo-Texans, rather than being repelled by grasslands, were quite favorably inclined toward them and actually sought out prairies as places to settle, so long as timber was available in the vicinity.*" As a result, Francaviglia suggests that the forested areas in the Cross Timbers were settled relatively late. Jordan concluded that "[*C*]*onsequently, it was the late-comers who settled either the closed forests, where no prairies were present, or the open grasslands devoid of timber.*"

Other factors that encourage human settlement were access to dependable water and transportation routes. As Gutmann and Sample (1995) noted in their interpretation of early Texas settlement "[*W*]*e found that water was important, but that man's other means of manipulating the environment – especially the transportation network – probably contributed as much or more to the extent to which people lived in rural Texas".*

This pattern, people selecting areas where grasslands, trees, water and transportation coincide to build homes, continues in recent times as was implied when the original adjacent landowner activities guidelines were developed, in the early to mid 1970's (see USACE, 1971; 1973; 1976a; 1976b). Those documents

describe the environmental conditions that occurred in the early 1970's, highlighting the pressure that an expanding Dallas-Fort Worth population was exerting on Cross Timbers and grasslands surrounding both lakes.

Other actions examined for this cumulative effects analysis included past actions, present actions, and reasonably foreseeable future actions (RFFAs), regardless of whether these actions have been or will be done by governmental agencies or the private sector. Some RFFAs are difficult to identify with any specificity due to uncertainties related to approvals, funding, etc. The primary reference document used to delineate historical and current actions was the Lewisville Lake Programmatic Environmental Assessment (USACE, 1999). Nine categories of reasonably foreseeable future actions of particular relevance to Grapevine and Lewisville Lakes are maintaining or building bridges and roadways, water-related developments, enhancements of parks, utilities within and outside exiting easements, construction of golf courses, construction of hotels, hike/bike trails, and land use classification changes.

The cause-and-effect relationships between human activities and resources, ecosystems, and human communities were considered by identifying and describing common pathways or connections between the adjacent landowner guidelines, related past, present, and reasonably foreseeable future actions, and the affected resources, ecosystems, and human communities. Mowing and underbrushing causes alteration of habitat as do myriad human activities in the area. Mowing and underbrushing can effect water quality from erosion and the potential use of herbicides as do other human activities such as erosion induced from construction or agricultural activities in the area. Mowing and underbrushing can alter the access that adjacent landowners have to nearby lakes unlike most other activities.

Ideally, the magnitude of cumulative effects would be quantified in order to assess the cumulative significance of altering adjacent landowner guidelines on habitat alteration, water quality and adjacent landowners. However, such data were not available. For example, the number of acres of Cross Timbers that have been altered by humans since the early- to mid-1800's has not been measured. While maps from as early as 1849 show the Cross Timbers, we can only estimate the area that they occupied at that time and reasonably conclude that most of the Cross Timbers have been altered by humans over the past 150 years. Likewise, we must use our professional judgment when interpreting historical documents (e.g. Duck and Fletcher, 1943) that noted that the region's faunal diversity could be attributed to its being a forest-grassland ecotone that contains dominants from both the deciduous (forest) formation and the grassland formation. These studies lead to a professional opinion that native Cross Timbers and Blackland Prairies are under tremendous human pressure, and since there is relatively little Federal lands in Texas, what is left of the Cross Timbers and Blackland Prairies on Federal land needs maximum protection. This opinion is mimicked by the Texas Parks and Wildlife Department (Schmidly, Parker and Baker, 2001). While there are no studies available that indicate how much erosion and/or herbicides have entered Grapevine and Lewisville Lakes, we must approximate the impact by looking at studies that have examined water quality near riparian buffers as well as the water quality exceedances that have been reported at Grapevine and Lewisville Lakes. Those reports indicate that the exceedances that have occurred at the two lakes involve nutrients (and pH), and the water quality studies examined indicate that a riparian buffer protects water quality from excessive nutrient pollution. Likewise, we have no way of quantifying the number of encounters that adjacent landowners have with species they would rather not encounter, but can only estimate the potential number of adjacent landowners that might eventually live next to one of the lakes and compare that to the human population in the region. Finally, we can only qualitatively assess the number of access path that might occur under the individual access path or the community access path alternative.

Therefore, significance of cumulative effects was determined based upon the qualitative analysis of the magnitude of cumulative effects discussed above, and a consideration of historical, current, and forecasted conditions for the affected resources, ecosystems, and human communities within the temporal and spatial boundaries defined above, along with relevant regulatory thresholds and professional judgment. For Grapevine and Lewisville Lakes, three direct and indirect incremental impacts have been identified: habitat alteration (direct impact to an ecosystem), water quality (indirect impact to a resource) and adjacent landowners (indirect impact to a human community). The incremental impact on these three environmental factors triggers an examination of the cumulative effects on these three factors by other past, present and reasonably future actions. While direct and indirect effects may be negligible, the total cumulative impact may be significant. Table 6-1 indicates significance thresholds that were used in this programmatic environmental assessment for each of these three environmental factors.

Table 6-1. Cumulative Effects Significance Thresholds.

Incremental effect	Cumulative beneficial significance threshold	Cumulative adverse significance threshold
Habitat alteration	Most of former Blackland Prairie or Cross Timbers protected or restored.	Last of Blackland Prairie or Cross Timbers altered.
Water Quality (turbidity, herbicide contamination)	Water quality (turbidity and herbicides) brought into compliance with water quality standard where it was out of compliance.	Water quality (turbidity and herbicides) out of compliance with water quality standard.
Adjacent Landowner	Access to shoreline essentially unobstructed. Encounters with undesirable species on private land eliminated. Risk of wildland fires damaging or destroying structures on private land eliminated.	Access to shoreline effectively obstructed. Encounters with undesirable species on private land constant. Risk of wildland fires damaging or destroying structures on private land substantially higher than natural risk.

Because the allowable adjacent landowner activities represents a management activity, the alternatives examined all had measures to avoid, minimize, or mitigate significant cumulative effects. For example, some alternatives have a reduced width of the mowing/underbrushing zone, which minimizes the amount of habitat alteration. Additionally, ecosystem based vegetation management plans have been suggested that can lead to altered erosion potential and ultimately alter water quality in the lake, and change the accessibility that adjacent landowners have to the shoreline. Finally, the ecosystem based vegetation management activities to be implemented in the habitat management zone are considered to be adaptive ecosystem management plans. Therefore if unanticipated effects are observed as a result of implementing any of the vegetation prescriptions, appropriate changes in the management strategy will be examined.

Table 6-2. Cumulative Effects of Preferred Alternative and Other Past, Present and Reasonably Foreseeable Future Actions.

Time	Action	Impacts on Environment[1]			Comments
		Habitats	Water Quality (turbidity and herbicides)	Human Community (access, encounters, wildfires)	
Past	Construction of reservoirs	a	a	b	The primary impacts from past actions were induced by the construction of the reservoirs. EISs were written for the maintenance and operations of those reservoirs.
	Rise in Pool Elevation	a	nc	b	
	Vegetation Modification	a	a	b	
	Water-related recreation	a	a	b	
	Land Use Classification Changes	a	a	b	
Present	Vegetation Modification	a	a	b	Habitat modification from development around the reservoirs has been substantial. The incremental increase in habitat modification from mowing/underbrushing could mimic the impact of a large development. Water quality impact from water related recreation was limited in a recent carrying capacity environmental assessment that set limits on the number of boats allowed on lakes.
	Water-related recreation	a	a	b	
	Current Adjacent Landowner Activities	a	a	b	
Future	Future Adjacent Landowner Activities	b	a	b	All actions from Lewisville Lake PEA 1999- all adverse impacts either temporary during the construction phase or not considered significant
	Bridges and Roadways	a	a	b	
	Water-Related Development	a	a	b	
	Enhancement of Parks	a	a	b	
	Utilities Within Existing Easements	a	a	b	
	Utilities Outside Existing Easements	a	a	b	
	Construction of Golf Courses	a	a	b	
	Construction of Hotels	a	a	b	
	Hike/Bike Trails	a	a	b	
	Land Use Classification Changes	a	a	b	
Significance Threshold Crossed?		No	No	No	

[1]a-small adverse, A-significant adverse, b-small beneficial, B-significant beneficial, nc-no change; see Table 6-1 for cumulative effects significance thresholds.

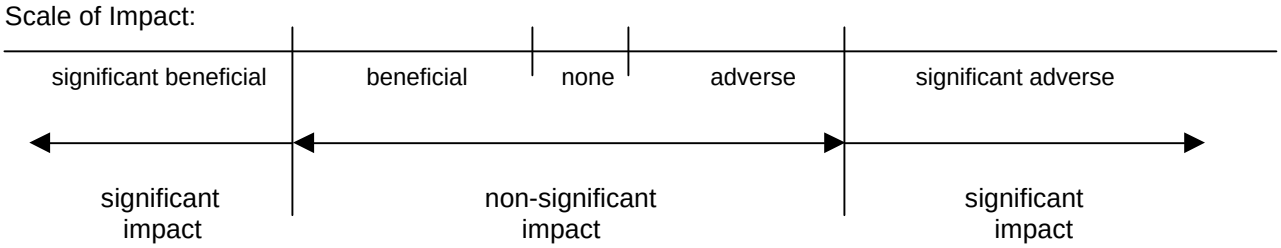
Chapter 7: Findings and Conclusion

After examining the affected environment and considering the environmental impacts of seven alternative strategies for adjacent landowner activities guidelines, the preferred alternative is the Narrow Shoreline Variance, Alternative 7.

If the impacts of this alternative for adjacent landowner activity guidelines are considered significant, as defined in the Council on Environmental Quality regulations (40 CFR 1508.27), an Environmental Impact Statement is required. If the analysis concludes that any impacts associated with a preferred alternative would not be significant, then a finding of no significant impact can be issued.

There is a continuum of potential beneficial or adverse impacts from an action for any given resource. As suggested in Figure 7-1, there may be no impact on a specific resource, perhaps because there is no incremental impact from the action (for example the action will have no impact on a resource like ground water). Perhaps when the incremental impact from the project is added to other past, present and reasonably foreseeable future impacts, the total impact is within natural variation of that resource, and therefore no significant impacts would be forecast. Perhaps a small beneficial or adverse impact might occur, but the level of effect would be small enough that the resource affected has ample capacity to absorb the effect, or the total impact does not a regulatory threshold (e.g. a water quality standard). Finally, an impact may be large enough that a significance threshold is crossed.

Figure 7-1. Distinguishing between significant and non-significant impacts.



The Council on Environmental Quality regulations require that an action be analyzed in terms of "context" and "intensity" (40 CFR 1508.27). The action must be considered in several contexts such as society as a whole (human, national), the affected region, the affected interests and the locality. For this action, considering new allowable adjacent landowner activities guidelines, there is no effect on society as a whole. The affected region, north central Texas, is experiencing rapid growth and development and there is continuing pressure on lands surrounding Grapevine and Lewisville Lakes from the ever increasing private developments adjacent to Federal lands. Likewise, Grapevine and Lewisville Lakes were constructed in ecoregions known as the Blackland Prairies and the Cross Timbers, both considered to be highly valuable and rapidly disappearing habitat types in region. Finally, the affected interests and locality in our context the adjacent landowners that live part or full time on these properties, currently number in the range of a few hundred families, but based on the number of private parcels of land that adjoin Grapevine and Lewisville Lakes, may soon exceed one thousand. Parcels that are currently not developed, will almost assuredly be developed sometime in the future, and pressure from adjacent landowners to mow and underbrush and develop access paths will continue. As the CEQ regulations state, in the case of site-specific actions, significance would usually depend upon the effects in the locale rather than in the world as a whole.

Intensity refers to the severity of impact, and CEQ provides 10 intensity issues to consider for significance determination. Table 7-1 lists these issues, and summarizes the factors analyzed, the facts found and the connections between those facts and the finding of no significant impact.

Table 7-1. Significance determination for the Narrow Shoreline Variance Alternative (preferred alternative)

Consideration			Effect	Significance Threshold	Exceeded
Environmental Impacts	Mowing/Underbrushing		See Tables 4-3 through 4-14	substantial habitat quality lost, water quality standard exceeded, adjacent landowners denied access to shore	No
	Habitat Management		See Table 4-3 through 4-14	substantial habitat quality lost, water quality standard exceeded, adjacent landowners denied access to shore	No
	Access Paths		See Table 4-15	substantial habitat quality lost, water quality standard exceeded, adjacent landowners denied access to shore	No
Public Health & Human Safety	Mow & Underbrush	Decrease	more encounters with rodents and snakes; increase of fire (or the perception of an increase) due to increased grass and underbrush	more than 1% of population has public health and safety compromised	No
		Increase	no effect on health and public safety		
	Habitat Management	Restoration of Native Veg.	no effect on health and public safety		
		Control of Undesirable Veg.	if not controlled, more poison ivy could increase incidents of reactions; if controlled with herbicides, increased risk of water contamination	contaminate drinking water supply above regulatory standards	No
		Establishment of Buffer Zone	protect water quality	contaminate drinking water supply above regulatory standards	No
	Access Paths	Change in Number	no effect on health and public safety		
Unique Characteristics of area	Adjacent landowner activities guidelines.		Study area is within an ecosystem known as the Blackland Prairie and Cross Timbers, both rapidly disappearing and considered highly valuable by Texas Parks & Wildlife as extremely valuable	substantial habitat quality lost	No
Controversial Effects on Human Environment	Mow & Underbrush		little or no scientific controversy on the effects of mowing and underbrushing.	other resource agencies or scientific groups dispute the size, nature or effect of mowing and underbrushing	No
	Habitat Management		some scientific controversy on the ability to effectively manage ecosystems without introducing unexpected consequences.	other resource agencies or scientific groups dispute the size, nature or effect of habitat management prescriptions	No
	Access Paths		little or no scientific controversy on the effect of paths to shorelines	other resource agencies or scientific groups dispute the size, nature or effect of shoreline management prescriptions	No
Uncertain Effects on Human Environment	Mow & Underbrush		little or no uncertainty of the effects of mowing and underbrushing	other resource agencies or scientific groups offer evidence that is substantially different than presented	No
	Habitat Management	Restoration of Native Veg.	some uncertainty of the unintended consequences of habitat management	other resource agencies or scientific groups offer evidence that management prescriptions are incorrect	No
		Control of Undesirable Veg.	amount of herbicides applied unknown	other resource agencies or scientific groups offer evidence that is substantially different than presented	No
		Establishment of Buffer Zone	little or no uncertainty of the effects of buffer zones	other resource agencies or scientific groups offer evidence that is substantially different than presented	No
	Access Paths		little or no uncertainty of the effects of access paths	other resource agencies or scientific groups offer evidence that is substantially different than presented	No

Table 7-1. Significance determination for the Preferred Alternative (continued)

Consideration			Effect	Significance Threshold	Exceeded
Precedents for Future Actions with Significant Affects	Mow & Underbrush	Increase	More area in high disturbance	substantially more area mowed	No
	Habitat Management	Restoration of Native Veg.	does not set a precedent		
		Control of Undesirable Veg.	herbicide use on Federal lands	contaminate drinking water supply above regulatory standards	No
	Access Paths	Change in Number	adjacent landowner access to shoreline	quality public outdoor recreation experiences for present and future generations and long term public access to public lands denied	No
Cumulative Effects	Habitat quality		see Table 6.2	see Table 6.1	No
	Water quality		see Table 6.2	see Table 6.1	No
	Human Community (access paths)		see Table 6.2	see Table 6.1	No
Adverse Effects on Cultural Resources			no cultural resources in study area would be affected by mowing/ underbrushing, habitat management, or access paths		No
Endangered or Threatened Species			no endangered or threatened species occur in study area		No

Chapter 8: Public Involvement

A. Agency Coordination

This section discusses consultation and coordination that occurred during preparation of this document. This includes contacts made during development of the proposed action, other alternatives considered, and writing of the EA. Letters were sent to Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency, Texas Commission on Environmental Quality, and Dallas Water Utilities asking to participate in a workshop to discuss alternatives for the EA. The workshop was held on June 28, 2004. Copies of agency coordination letters are presented in Appendix I. A separate coordination meeting was also held with USFWS in June 2004.

In addition, during the 45-day public review formal and informal coordination will be continued with the following agencies:

- State Historic Preservation Office (SHPO)
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency (EPA), Region 6 Office
- Texas Parks and Wildlife Department (TPWD), and
- Texas Commission on Environmental Quality (TCEQ)

B. Public Workshops

Letters were sent to cities and counties that have interests in Grapevine and Lewisville Lakes requesting their participation in a workshop to assist in developing alternatives for the EA. A meeting with 18 people was held on April 7, 2004 and minutes from that meeting are located in Appendix K.

Letters were also sent to local Homeowner Associations on May 7, 2004 inviting their participation in workshops for developing alternatives for the mowing, underbrushing, and access path guidelines at Grapevine and Lewisville Lakes. A total of five workshops were held with Homeowner Associations and other groups. Meeting minutes from these workshops are also included in Appendix K.

In general, comments received during the workshops can be placed into four main categories. 1) Public Safety concerns related to children, undesirable (poisonous) vegetation, snakes, and predators. 2) Concerns relating to fire. 3) Concerns relating to EA distribution, Project Delivery Team, current permits, and process. 4) Concerns relating to erosion/water quality.

C. Public Information and Review

In February 2004, USACE issued a news release stating that it was going to prepare an EA for the revision of the mowing, underbrushing, and access path guidelines at Lewisville and Grapevines Lakes to be published in July 2004. In July 2004, USACE issued a second news release extending the publish date to October 2004 (Appendix J).

On May 11, 2004 USACE sent letters to all members of Fort Worth District's Environmental and Recreation Advisory Committee (ENRAC) list. The letter included copies of the existing mowing, underbrushing and access path guidelines and asked members to provide their comments related to modifying the existing guidelines.

USACE received over 30 letters from adjacent landowners or concerned citizens during the production of the EA. Comments reiterated the concerns covered in the public meetings and covered/supported the full spectrum of the alternatives considered in the EA. Letters were received requesting that USACE allow no mowing on Federal property and letters were received requesting to mow everything to the shoreline.

The draft version of this document is available for public review at the Grapevine and Lewisville Lake Project Offices and the Lewisville and Grapevine Public Libraries. In accordance with NEPA, a 45-day public review period of the draft EA will be provided via a Notice of Availability in the local newspapers and a local project mailing. Public comments and responses to comments are presented in Appendix J of this document.

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